

CONTRIBUTORS TO THIS NUMBER

CARL BECK M D Surgeon North Chicago Hospital

ARTHUR DEAN BEVAN M D Professor of Surgery at Rush Medical College in Affiliation with the University of Chicago Surgeon to the Presbyterian Hospital Chicago

BENJAMIN FRANKLIN DAVIS, M D, Assistant Attending Surgeon Presbyterian Hospital Chicago Instructor in Surgery Rush Medical College Chicago

KAETHE W DEWEY M D Instructor and Research Pathologist College of Dentistry University of Illinois

DANIEL N EIGENDRATH M D Clinical Professor of Surgery Rush Medical College Chicago Attending Surgeon Michael Reese and Cook County Hospitals Chicago

J S EISENSTAEDT M D Associate Genito-urinary Surgeon Michael Reese Hospital Chicago

DR GATEWOOD Instructor in Surgery Rush Medical College Chicago

ALBERT EDWARD HALSTEAD M D Professor of Surgery and Clinical Surgery School of Medicine University of Illinois Senior Surgeon St. Luke's Hospital Chicago Consulting Surgeon Illinois Charitable Eye and Ear Infirmary

WILLIAM M HARSHA M D Professor of Surgery and Clinical Surgery College of Medicine University of Illinois Attending Surgeon St. Luke's Hospital Chicago

WILLIAM F HEWITT S B M D Assistant Attending Obstetrician and Gynecologist to Presbyterian Hospital Chicago Instructor in Obstetrics and Gynecology at Rush Medical College of the University of Chicago

CHARLES E HUMISTON M D Professor of Clinical Surgery College of Medicine University of Illinois Attending Surgeon to Cook County and West Suburban Hospitals

GUSTAV KOLISCHER M D Attending Surgeon to the Genito-urinary and Radio-Therapeutic Departments, Michael Reese Hospital Chicago

VICTOR D LE SPINASSE M D Assistant Professor of Genito-urinary Surgery Northwestern University Medical School

B F LOUNSBURY M D Surgeon to Washington Boulevard Hospital

GOLDER LEWIS McWHORTER M D Instructor in Surgery Rush Medical College Chicago

KARL A MEYER M D Assistant Professor of Surgery University of Illinois

W F MCNCREIFF M D Assistant in Surgery University of Illinois

ROY L MOODIE M D Assistant Professor of Anatomy College of Medicine University of Illinois

FREDERICK B MOOREHEAD M S M D Assistant Professor of Surgery Rush Medical College Assistant Surgeon Presbyterian Hospital

EDWARD LOUIS MOORHEAD M D Surgeon to Mercy Hospital, Chicago Adjunct Clinical Professor of Surgery Northwestern University Medical School

ALBERT J OCHSNER M D LL.D Surgeon in Chief Augustana and St. Mary's Hospitals, Chicago Professor of Clinical Surgery in the Medical Department of the State University of Illinois

WILLIAM EDWARD O'NEIL, A M M D Surgeon Evanston Hospital Evanston Illinois

ROGER T VAUGHN M D Instructor in Surgery Rush Medical College Chicago Attending Surgeon Cook County Hospital Junior Attending Surgeon St. Luke's Hospital Chicago

THOMAS J WATKINS M D Professor of Gynecology Northwestern University Medical School Gynecologist, St. Luke's Hospital Chicago

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SURGICAL CLINICS OF CHICAGO

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CONTRIBUTION BY DR. ROY L. MOODIE

DEPARTMENT OF ANATOMY UNIVERSITY OF ILLINOIS
COLLEGE OF MEDICINE

STUDIES IN PALEOPATHOLOGY. ANCIENT SKULL LESIONS AND THE PRACTICE OF TREPHINING IN PREHISTORIC TIMES

Summary Nature of skull lesions modified by shape of skull. Known lesions fracture, tumor, necrosis, sinus, tis, perforations. Trephining the most ancient and highly developed of all surgical practices, most highly developed in France in Neolithic times and in later times in Peru. Trephining not an accompaniment of culture. Nature of the trephine opening. Methods of procedure: cutting, sawing, scraping and boring—28 per cent of operations in Peru performed for relief of fracture. Some knowledge of aseptic surgery possible—many of the trephine openings healed without infection.

THE shape of the skulls of ancient animals modified greatly the nature of the fracture or other injury to which this organ was liable. Thus the oldest known skull fracture, that of an ancient Triassic phytosaur (Fig. 139) does not involve the brain case at all but is *confined to the snout* of this early reptile. The group of animals to which this creature belonged was in appearance much like the modern crocodiles although structurally quite different. The nostrils (Fig. 139) were located far back toward the eyes and the long snout was doubtless used in probing in the mud of the ancient rivers and lakes for burrowing shell fish or other animals and the long terminal teeth were useful in extracting the prey from the mud. This particular creature whose skull is shown herewith (Fig. 139) in the act of turning over a large stone or log, had the misfortune to fracture its snout as indicated in the fossilized skull. The lesion was a long time in healing having become badly infected by the bac-

teria of the ancient river bed, as shown by the large necrotic sinus on the dorsal aspect of the callus surrounding the fracture. This fracture, with an antiquity of twenty million years, initiates our knowledge of skull lesions of past time.

The next oldest fracture is that of the mandible of one of the giant, heavily armored three-horned Dinosaurs, known as *Triceratops*. The fracture had healed with the formation of little callus and there is no indication of sepsis. This lesion has an antiquity of seventeen million years.

The lesion which next attracts our attention as we ascend the geologic scale is that of the mandible of a three-toed horse, *Equus caballus* from the Miocene having an age of

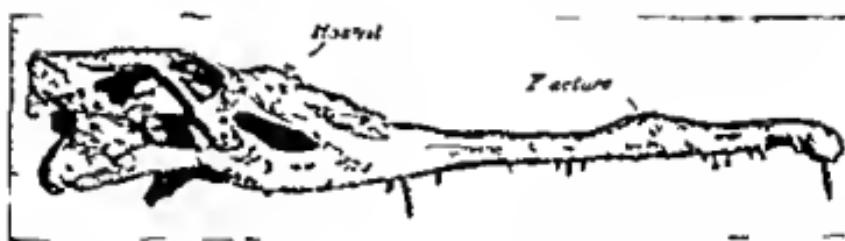


Fig. 139.—Skull of an ancient reptile a phytosaur *Vetriorhynchus Plieningeri* 2,000,000 years old showing on the snout the oldest known skull fracture which had healed with the formation of considerable callus. The specimen is from the Triassic of Europe.

one million five hundred thousand years. The left ramus shows a distinct swelling indicating the presence of a large fistula possibly *actinomycosis* in its early stages. This fistula is accompanied by alveolar osteitis resulting in the absorption of the alveolar margin and pyorrhea possibly was present in the gingiva.

Our knowledge of further head injuries or infections for the succeeding million years is a blank and we must look to the animals of the Pleistocene to study further ancient skull injuries. Here in the period immediately preceding our own are known two skulls which show very definite injuries. One is an early Pleistocene bull *Mastodon americanus* whose skull (Fig. 140) had been badly fractured in a fight or possibly by a falling

tree. This injury fractured only the outer skull table, and since the diploe is several inches thick there was no succeeding endocranial affection. In the left temporal fossa, also, there is a large necrotic sinus into which one may pass his hand to a depth of several inches although this did not apparently penetrate beyond the inner table.

Muskoxen, now restricted to the northern portions of Canada, in Pleistocene times wandered over the greater share of the



Fig. 140.—Skull of an old bull *Mastodon americanus* possibly 100,000 years old showing on the right occipital region an extensive skull fracture partially healed and in the right temporal fossa a large necrotic sinus. The skull is in Yale University Museum and is from the Pleistocene of New York.

North American continent and like their successors of today doubtless indulged in fights with their sharp, heavy horns. A male skull (Fig. 141) found in Michigan shows a large necrotic sinus penetrating into the maxillary sinus and doubtless the creature was inflicted with a chronic suppurating sinusitis, possibly due to a sharp blow from the horn of an opposing bull.

This brief review completes our knowledge of skull injuries

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This brief review completes our knowledge of skull injuries

prior to the advent of man. All skull injuries of ancient man, apparently, were inflicted by human instruments some by the instruments of war, such as the ancient skull described by Ameghino and called by him *Diprothomo platensis* which shows a perforating injury of the left frontal bone, doubtless produced by a stone arrow point.

The Antiquity of Trephining—Man first performed trephining many thousands of years ago and skulls with three or



Fig. 141.—Skull of a muskrat, *Syndes carifrons*, possibly 80,000 years old from the Pleistocene of Michigan showing (at the arrow) a lesion possibly indicating a chronic suppurating sinus. The skull is preserved in the University of Michigan.

even four large trephine openings are known from the Neolithic period with an antiquity of possibly twenty-five thousand years.

A study of the primitive art of trephining or trepanning is a phase of paleopathology which deserves recognition since the operation was doubtless performed for the relief of some form of injury or disease of the head or brain and also because the operation itself was a traumatism often of a very serious and frequently fatal nature. The mortality rate based on very inexact data for trephining among primitive and prehistoric peoples has been estimated at between 50 and 75 per cent while

the modern mortality rate as given by Krause is now possibly 15 to 18 per cent being the average. In the middle of the last century before the advent of asepsis Dieffenbach regarded trephining as a certain means of killing a patient. Later Leser reported 36 cases of trephining for injury to the skull without a death traceable to the operation itself. However death is likely to ensue from collapse of the brain and severe hemorrhage of the diploe since often in prehistoric times extensive plaques of bone were removed.

Trephining or trepanning the skull was an operation frequently performed ten thousand or more years ago in Neolithic times especially in western Europe and in Bohemia. The first prehistoric trephined skull was found in Cocherel France in 1685 and the subject has attracted considerable attention from anthropologists who began an active discussion of the subject in 1872 when Prunieres Broca and others initiated the subject. Evidences of its practice in early times are also found in Bolivia Peru Michigan Mexico and Central America although none of these evidences are of Neolithic age. There is no evidence of the operation being performed by either the Hindoos or Chinese nor among the Greeks and Romans. A single doubtful example of trephining is figured by Sir Marc Armand Ruffer from the early graves of Egypt. Some trepanned skulls have been discovered in Gaul belonging to an epoch corresponding to that of the Roman civilization. The regions where it received the greatest attention in ancient times were Peru and France.

The contemporary hill tribes of Daghestan the natives of Tahiti the Polynesians and Loyalty Islanders the Kabyles (Fig. 148) of Algeria (but not the Arabs or Negroes in contact with them) the Montenegrins and the Aymari Indians of Bolivia and probably in the highlands of Peru still perform this operation and thus express their belief in its efficacy. The native tribes are very secretive about their procedures and little is definitely known about their methods although Bandelier in Bolivia and Hilton Simpson in Kabylia North Africa have been so fortunate as to observe the operation.

The operation in Bolivia is performed by the shaman who is often also a medicine man with a well sharpened pocket knife a piece of sharp glass or sharp-edged stone the process being one of cutting and scraping. The operation is often performed following a depressed fracture of the skull received in one of the frequent brawls of the Indians on feast days when quantities of intoxicating liquors are consumed. Many of the



FIG. 142. Skull from a Neolithic sepulchre in France which had been trepanned in three places. The patient recovered from at least two of these operations since the margins of the openings are healed over. After Bau down.

recent Bolivian skulls show evidence of more than one operation and as many as four are known to have been made with success. The openings are large and rudely made and the operation fatal in a high percentage of cases must have been excruciatingly painful. The plaques of bone after being pried out were not replaced but a mass of grass or any dirty greasy cloth in reach was often inserted under the scalp with consequences which one shudders to consider.

Common and wide spread as trephining (Fig. 142) was in Neolithic times, yet very little is known of its purpose or the method of procedure of the prehistoric surgeon, save by comparison with modern methods, as used by primitive peoples. Broca decided that prehistoric surgical trephining was performed for the relief of certain internal maladies. He suggested that it was performed on young epileptic or mad persons to rid them of the 'genius,' the "demon" causing the dreaded symptoms. They may have performed the operation for the relief of depressed fractures, but as many of the trephined skulls show no sign of accidents, headaches are very probably to be considered



Fig. 143.—Cranial amulets or rondelles possibly taken from trephine opening in the living but more probably derived from dead skulls. These are supposed to have been used as charms and often perforated (B) and worn as a necklace (After Fletcher.)

an important indication for this operation. A religious significance has been attached to the procedure but there is no recent evidence to support this view. A large percentage of the ancient Peruvian skulls were trephined for the relief of fractures either depressed or linear.

The trephine hole is usually located on the upper and posterior part of the parietal bone,¹ probably because this region was most easily accessible to the operator in a period when beds and chairs were not used. In Bolivia the patient sits or reclines

¹ Two Neolithic skulls described by Manourier were trephined one in the temporal the other in the posterior part of the frontal. One of the skulls described by Prunier is trephined in the right occipital. Several of the Peruvian skulls are trephined in the frontal.

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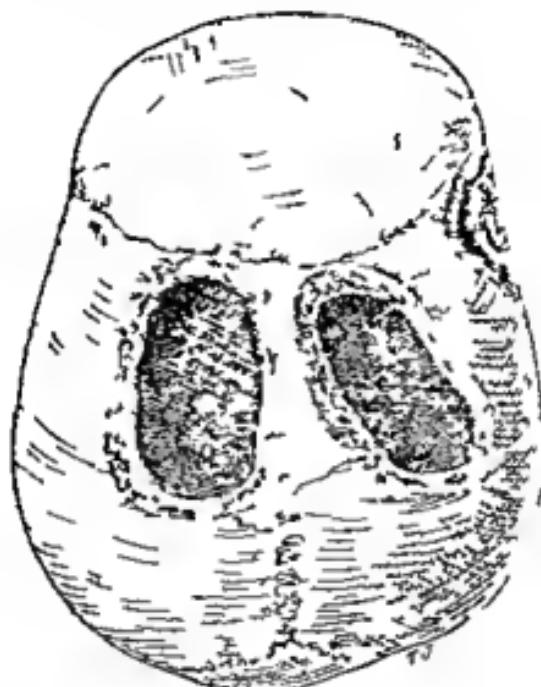


Fig. 147.—Skull from a Neolithic sepulchre in France which had been trepanned in three places. The patient recovered from at least two of these operations since the margins of the openings are healed over. (After Baudouin.)

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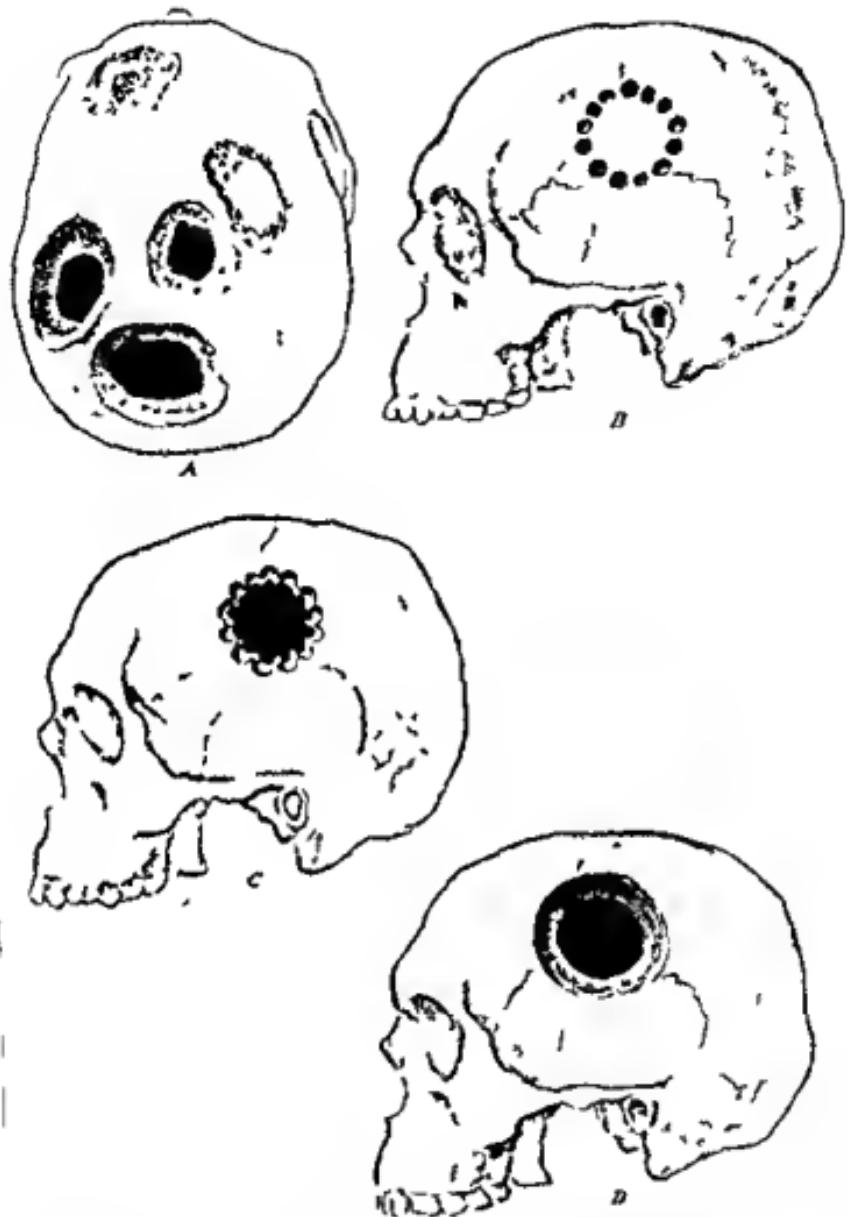


Fig. 145—*A* A very unusual ancient Peruvian skull showing five trephine openings two of them incomplete. *Edmundo Escomel* of Arequipa

Lucas Championnière. *C* The rondelle or plaque of bone removed. The resemblance of this opening to the trephined skull in the Trocadéro Museum is evident. *D* The crenated margin removed by chiseling, with the result so commonly seen in prehistoric trephined skulls.

against a mossy bank, or the head is supported on the knee of the operator. The operation, according to Lucas Championnere (Fig. 145, *B, C, D*), was not performed by scraping, since this would take a long time, would result in profuse hemorrhage, and would not result in the production of a rondelle or cranial

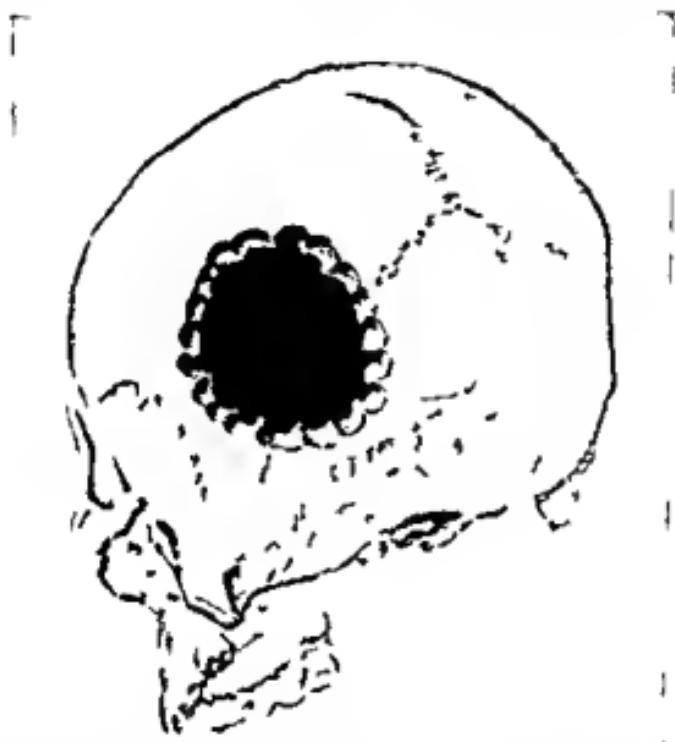


Fig. 144.—Trepanned opening of the skull of an ancient Peruvian mummy at the Trocadéro Museum, Paris. When discovered the skin covered the opening like an operculum. On the basis of this skull Lucas-Championnere formulated his hypothesis of prehistoric trepanning as outlined on a later page. This is the only example of a Peruvian skull known with this type of opening. (Drawn from a photograph by Professor Verneau.)

amulet (Fig. 143) so prized by prehistoric peoples for wearing (Fig. 143, *B*) as a necklace, but was doubtless produced by a sharp cutting or sawing instrument similar doubtless to the methods employed by the New Caledonians (Fig. 148) today, and by the ancient Peruvians, who probably used a notched knife or saw of bronze (Fig. 146 *A, B*)

ostitis, perhaps also of traumatic origin, (d) lesions possibly of a syphilitic nature. Some doubt has been expressed as to the age of the specimens described by Tello, and especially is the nature or even the existence of pre Columbian syphilis in doubt.

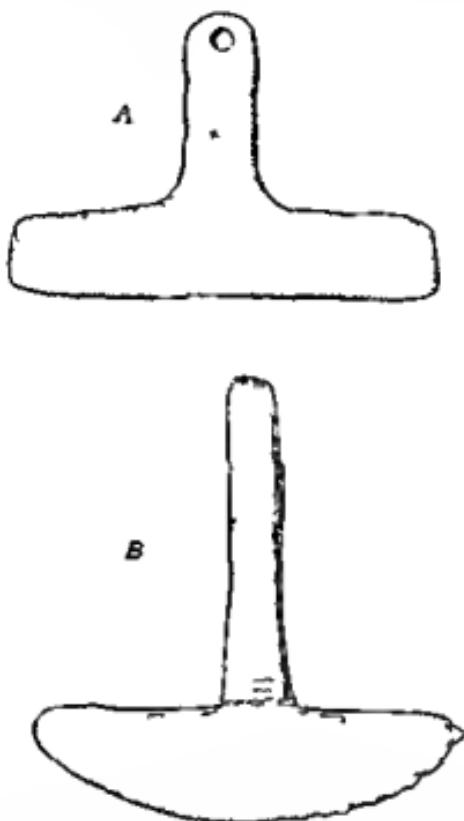


Fig. 146. Ancient Peruvian knives of bronze. A. Bronze knife with pierced flat handle slightly marred. B. Bronze knife with heavy square sectioned handle incomplete. These knives were discovered and figured by Dr. George F. Eaton of the Yale University and National Geographic Society Expedition to Peru. They are possibly similar to the ones used by the ancient Peruvian surgeon in trephining. Where the openings show evidence of sawing one of these knives with a notched edge may very well have been used.

Syphilis in ancient Peru as well as in modern times has been confused with yaws and with uta or leishmaniasis, the existence of which in ancient Peru is recorded on Incan water jars described by Palma and Tamayo. Bone lesions in Peru of known pre Columbian age which can be accurately ascribed to syphilis are not known but after the invasions of the Spaniards

The operation was often performed several times on the same individual and Neolithic skulls are known with three or four trephine openings (Fig. 147). Its frequency is suggested by the discoveries in the Neolithic sepulchral chambers at Vendeuvre some sixty miles to the east of Paris. Remains of over 120 individuals representing both sexes and all ages were found within this ancient tomb. A fall of earth and rocks had buried the doorway of the sepulchre about the close of the Neolithic period for all the worked flints and ornaments found within the sepulchre were of that age. No less than 8 skulls had been operated by trepanning and many of them had survived the operation as seen by the healing of the edges of the wounds, a process of extreme slowness in the skulls of adults.

Trephining in Ancient Peru.—The antiquity of the surgical procedure of trephining in western Europe has been discussed above and it remains to be told here to what a high degree of frequency (Fig. 148) it was performed in the Western Hemisphere especially in Peru. Some of the probable causes for this operation and the basis on which the conclusions rest.

A skull probably trephined *post mortem* was discovered at Chacacavo near Lima, Peru and described by Otis Mason. It is easily possible that the operation may have been fatal since there are other skulls such as the one described by Escamor which shows that after two successful Fig. 145, 1 operations the third was fatal. Many of the operations Fig. 147) seen in the skulls of the Muniz collections were performed during life. Many of the skulls illustrated in this collection show good recovery and partially healed wounds but the percentage of pre and *post mortem* operations in Peru has not been determined. The indications for the operation as outlined by Tello of Lima are (a) an antecedent fracture, (b) a simple traumatism of the cranium which denuded the periosteum followed or not by an inflammatory process, (c) a circumcised peno-testis or a teponci.

¹ Edmundo Escamor. *Un caso interesante de trepanacion enca en La Crónica Médica Lima, 1916.*

² Muniz, M. A. and McGee W. J. *Primitive Trephining in Peru*. 16th Ann. Rep. Bur. Amer. Ethnology. Washington 1929.

after 1530, syphilis became wide spread throughout the moun-
tamous districts of Peru

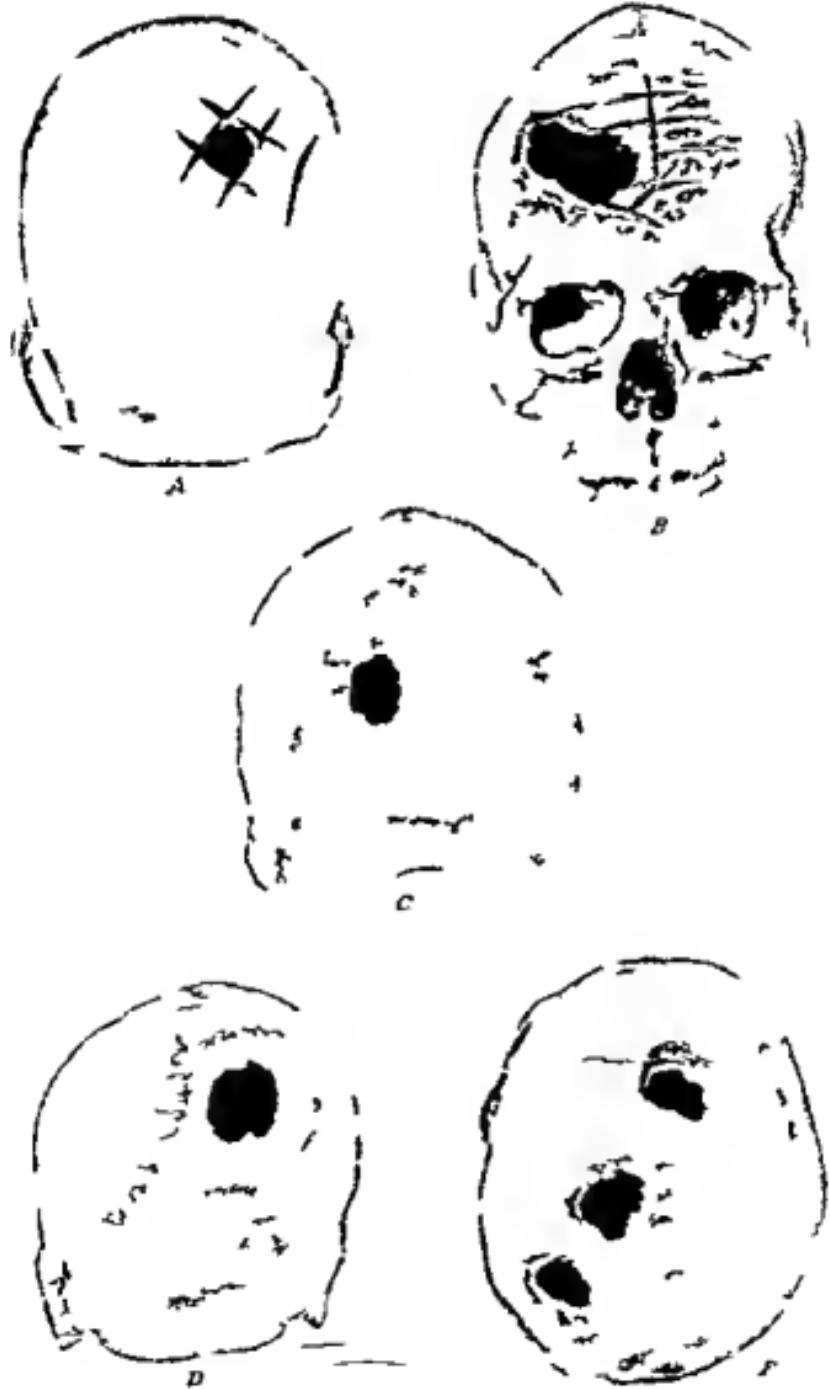
The openings made in trephining the skull were of various shapes and sizes (Fig 147) and doubtless the operation varied greatly as to nature of the opening. Lucas Championnière¹ has suggested, and has demonstrated (Fig 145 *B C, D*) his suggestion by an experiment, that the rounded openings were produced by boring a succession of holes with a rounded flint or bronze knife (Fig 146) and then the plaque chiseled out (Fig 147 *B C D*). Many skulls, such as the one secured in 1873 by Squiers show definite evidences (Fig 147 *A B*) of being produced by a sawing instrument (Fig 145 *A B*) and some of them indicate that the operation was produced by scraping. A series of figures (Fig 147) show the types of openings produced.

The practice of trephining among the Peruvians in pre-Columbian times may have spread from Peru northward to Mexico and Central America though there is little other evidence to point to the mingling of the Inca, Nahua and Aztec cultures. Lumholtz and Hrdlicka however, have recorded cases of trephining among the ancient Tarahumares of northern Mexico. The practice of trephining among the modern Indians of Mexico is unknown. The skulls found in Michigan have trephine per-

¹ Lucas-Championnière. *Trépanation néolithique*. *trépanation pré-*
C

¹
two figures

Fig 147—Ancient Peruvian skulls showing different types of openings.
A Skull opened by a saw or notched knife. An attempt at a second opening was made to the right of the completed opening. *B* Skull showing very crude opening in the right frontal with a large plaque of bone removed after several abortive attempts. The darkened areas around the opening are doubtless due to a large blood clot. It is very doubtful if this individual survived the operation. *C* Skull with small rounded trephine opening in the left occipital region. The patient survived the operation for many years since the margins are completely healed. *D* Skull with large rounded trephine opening in the right parietal. The margins slope greatly and indicate some scraping process. *E* Skull with three moderate trephine openings on the vertex. (All figures taken from Muniz and McGee. *Primitive Trephining in Peru*. Smithsonian Rept. Washington 1894-5.)



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¹ Lucas Championniere *Trépanation néolithique* trépanation pré Colombienne trépanation des Kabyles trépanation traditionnelle Paris 1912

² C Lumholtz and Ales Hrdlicka *Trephining in Mexico* Am Anthropol Wash 1897 x 389-390 two pl C Lumholtz Unknown Mexico 1902 328 two figures

Fig 147—Ancient Peruvian skulls showing different types of openings
A Skull opened by a saw or notched knife. An attempt at a second opening was made to the right of the completed opening. B Skull showing very crude opening in the right frontal with a large plaque of bone removed after several abortive attempts. The darkened areas around the opening are doubtless due to a large blood-clot. It is very doubtful if this individual survived the operation. C Skull with small rounded trephine opening in the left occipital region. The patient survived the operation for many years since the margins are completely healed. D Skull with large rounded trephine opening in the right parietal. The margins slope greatly and indicate some scraping process. E Skull with three moderate trephine openings on the vertex. (All figures taken from Muniz and McGee *Primitive Trephining in Peru* Smithsonian Rept Washington 1894-5)

forations, but, unlike the usual trephined skulls, there is but a single opening and that in the vertex, suggesting the postmortem perforations practised by the South Sea Islanders in order to hang on a string the skulls of their enemies overcome in battle.

Origin and Significance of Trephining — A significant feature of the geographic distribution of the ancient and primitive peoples who practised trephining shows that it was not an accompaniment of culture and learning. It did not occur among the Greeks, Romans, Phoenicians, Babylonians or Egyptians. Among these people our modern civilization had its origin.



Fig. 149 — A modern trephined skull of an inhabitant of Kabylia, north Africa showing incomplete results (After Professor Verneau.)

Among the ancient Egyptians there have been a few cases ascribed to trephining. Thus, G. Elliot Smith in 1910 recorded a skull with a depressed fracture resembling a trephine opening. Derry described a skull (Fig. 149) which shows a clearly marked circular opening which though it resembles a trephine opening may be interpreted as a parietal perforation due to a dermoid cyst of the scalp. Dr. Ruffer has figured a skull which he is inclined to think may be a case of trephine, but there are no definite clear-cut examples and certainly the practice was not so wide spread as it was in western Europe and in Peru.



Fig. 149. A. *Skull* from Shurafa, Lower Egypt, found in a cemetery of Roman date about 1000 years old of a young woman about twenty-one years of age. Right lateral view showing remarkable parietal flattening (the position of the opening at the arrow) and the perfect condition of the skull. B. Posterior view showing posterior opening suggested to be due to a deformed cavity and surrounding a trephine opening. (Drawn from photographs by Derry.)

Trephining arose among the ignorant cave dwelling skin clad hunters of the western part of Europe who built no fine

temples and palaces as did the ancient Egyptians and Greeks. They were crude and did not cultivate the love of the beautiful as did the ancient Peruvians. Here, among an uncultivated uncultured and superstitious people, hindered in their intellectual development by the great Ice Age which afflicted their country in four periods, the practice of the art, so common today arose and spread among the adjacent peoples. Its significance at first may have been due to a superstition. Certainly it could not have been based on reason and an understanding of what they were doing.¹ How the Peruvians thousands of years later acquired or developed trephining we do not know since there is no known communication between the Stone Age periods of America and Europe save through a roundabout route involving an enormous and incredible transit of the culture through Alaska. Markham has suggested that the Peruvians have inhabited their section of South America since 1300 B.C. but there is little evidence to support his suggestion.

The practice of trephining surpasses in antiquity and in perfection of technic all other surgical arts of prehistoric peoples. The setting of fractured bones in splints was known among the ancient Egyptians. A jaw from the old Empire of Egypt described by Hooten shows clearly that an early surgeon perforated the mandible to drain an alveolar abscess. Certain skulls from Bolivia and Central America show that the teeth had been perforated and fitted with a porcelain inlay but there is no evidence of prophylaxis playing any part in the procedure but the work was probably an attempt to beautify the features.

¹ There is some evidence to show that the ancient Peruvians especially developed the art by practising on dead skulls, and reached their conclusions by experimentation. They often used plaques of gourd or pieces of metal to cover the opening and they doubtless carefully bound up the opening with healing herbs, pitch or gum. MacCurdy suggests that the ancient Peruvian surgeons possessed some rudimentary knowledge of asepsis since the embalming substances used by them in the preservation of the dead, such as Baume de Perou, menthol, salt, tannin, alkaloids, saponines and resins are of an antiseptic nature. There are a few indications that successful transplants of bone were made in the skull but its connection with trephining is not determined.

² E. A. Hooten, *Oral Surgery in Egypt during the Old Empire*, Harvard African Studies 1917, Cambridge 1, 29-32, one plate.

CLINIC OF DR DANIEL N EISENDRATH

COOK COUNTY HOSPITAL

INJURIES OF THE JOINTS IN WAR AND IN CIVIL LIFE¹

Summary Brief review of the pathology of the various forms of war injuries of joints and of the principles underlying their treatment. Presentation of 4 cases illustrating how the experience acquired during the war may be applied to the treatment of compound joint injuries in civil life with especial reference to primary suture, Carrel Dakin treatment and early mobilization. Additional remarks on re-education and rehabilitation by Mrs Minnie S Sgsbee

WE will take up joint injuries today, and to illustrate the subject I desire to present 4 cases which show all degrees of such injuries. In two of the cases I have applied three of the methods which surgical experience during the present world war has brought to our attention. These methods are the primary suture of wounds, the Carrel Dakin treatment, and early mobilization of infected joints. Before showing the patients let us define some of the terms employed in speaking of injuries of the joints, and then review some of the lessons in the war surgery of such lesions which we have been recently taught. In the surgery of civil life, joint injuries are divided into two primary groups (a) Simple or closed, in which there is no communication between the seat of injury and a wound in the adjacent parts (b) Open, compound, or penetrating injuries, in which, as in the analogous open or compound fractures, there is a more or less direct communication between the seat of injury in the surrounding soft tissues and skin and the cavity of the joint.

Cases of simple or closed injuries in the first group, which are encountered in our surgery of civil life differ so little from those seen in war that I will omit their discussion in the present

¹ This clinic was given on July 22 1918 to members of the Medical Corps U S Army

clinic. Sprains with laceration of one or more of the ligaments which reinforce the capsule of a joint, sprain fractures in which a spicule of bone is torn off in connection with ligamentous injury, and injuries belonging to the subgroup of internal derangements of joints and finally closed fractures of the diaphysis or epiphysis of a bone extending into the joint cavity, present the same symptoms whether incurred during war or in civil life, hence I will direct your attention exclusively to the second group.

Compound injuries of the joints as they are encountered in civil life can be divided as follows. (a) Contused wounds of the adjacent soft parts communicating either directly with the cavity of the joint or indirectly through the medium of a bursa lying over the joint. The crushing injury (contused wound) of the peri articular tissues may or may not be complicated by a fracture of the shafts or articular ends of the bones entering into the formation of the joint. (b) Incised lacerated or punctured wounds of the adjacent soft parts communicating directly or rather extending into the joint cavity. I have seen at rare intervals such wounds of the soft parts which did not communicate with the joint cavity at the time of injury but having become infected the joint became involved secondarily. (c) Gunshot wounds. In civil life revolver or rifle wounds constitute practically the only form seen. As in war injuries the missile may traverse the joint and emerge constituting a through and through injury or the bullet may be free in the joint (rare except in the knee) or it may be lodged in the diaphysis or epiphysis of one of the bones entering into the formation of the joint.

Let us next classify the compound war injuries of the joints and compare them with the similar group in civil life. War injuries of the joints differ from those of civil life in two ways first the greater amount of destruction caused by the various forms of projectiles employed at the present day and second a greater tendency to become infected owing to the fact that the soil of northern France and Belgium has been fertilized with animal excreta for centuries and hence abounds in bacteria.

especially those found in the alimentary canal of the domestic animals. The gravity of these war injuries depends upon

(a) The nature of the projectile and of the particles of clothing carried in by it

(b) Certain mechanical difficulties owing to the anatomic fact that many of the joints are composed of a series of cavities formed by the intra articular ligaments and the conformation of the articular ends of the bones entering into the formation of the joint

(c) Fissures and comminution of the articular ends of the bones, *i. e.*, the epiphyses which favor the retention of infection

Infection in both war and civil injuries of joints enters in one of four ways

(a) Carried in by the bullet or shell fragment, especially on particles of clothing

(b) An infected fissure in the shaft or in the articular end or an infected bursa (as in Case II) over the joint permits infection to enter the joints

(c) A peri articular infection of the soft tissues invades the joint by contiguity (This occurred in Case I)

(d) The joint is infected through a lacerated or incised wound which extends through the capsule, *e. g.*, when a bayonet, knife piece of glass (see Case III), or other agent penetrates the joint at the time of original injury or the joint capsule is lacerated as occurred in Case IV. Metastatic infection of an injured joint occurs so seldom that it needs only to be mentioned

In considering the pathology of joint injuries both in war and in civil life it is well to recall certain important facts. The synovial membrane like the peritoneum, will take care of a moderate amount of infection. There is, again analogous to our experience with other serous membranes, a great tendency for the infection to become localized. The tissues for a distance of 1 cm from the tract of the projectile are devitalized and offer an excellent medium for the growth of pyogenic organisms. If this tract can be excised within the first twelve hours, and all foreign bodies removed, including particles of clothing and missile and all completely separated fragments of bone, the joint

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all reaction has subsided (b) In cases with much loss of soft tissues or comminution of bone, primary or primary delayed suture, even a partial primary, is indicated, and has resulted in over 75 per cent of primary union I have just described under the head of pathologic changes what is understood by primary suture. It now remains to explain that by primary delayed suture is meant nearly the same as primary suture, but the synovial membrane alone is closed, and the other tissues are closed at a later date. Drainage is inserted temporarily down to the sutured capsule, but not through it.

Class 2—Wounds by shell, grenade, or bomb fragments. If the case is seen within the first twelve hours, primary or primary delayed suture should be done and mobilization begun on the next day, unless much muscle tissue has been torn, then one should wait five or six days.

Even if there is much damage to the soft parts and bone, one must try to do a primary suture as long as a fair articular surface remains. If the soft parts cannot be closed completely, a partial primary suture may be tried.

In the first two years of the war resection was almost the rule, but it is only permissible at present if the damage to the soft parts and bone are so severe that a functioning joint is impossible. Amputation is only indicated, as I have stated before, when the principal nerves and blood vessels are destroyed, or in cases of infection (especially of the knee) which cannot be controlled.

The great advantages of primary or primary delayed or partial primary suture in war surgery have become more and more evident as the percentage of success has risen, until at the present time not to attempt such a primary closure would merit severe criticism. The second great principle which war surgery has taught us in the treatment of injuries of the joints is the employment of early mobilization.

Williams in 1909 advocated immediate mobilization after injuries of the joints, and in 1917 he extended its use to infected joint injuries. I have had but one experience (see Case IV) with active mobilization in purulent arthritis, but Pool, Lee and

injury may be converted into a simple one by complete primary suture of each layer. For the first twelve to twenty four hours the infection is limited to the tract of the projectile, but after this the synovial membrane and the effused blood become infected. As soon as the joint itself is invaded pathologic changes take place rapidly. The endothelium of the joint surface is replaced by granulation tissue, then the underlying cartilage becomes eroded, adhesions form, and either fibrous or bony ankylosis results. I have outlined this sequence of pathologic changes because only one who fully understands the rapidity with which they follow each other can appreciate how easily infection of a compound injury of a joint may produce almost irreparable damage.

Varieties of War Wounds of Joints—These can be divided into the following groups:

1 Through and through, no projectile being retained. This can as a rule, only occur in the knee-joint, rarely in the shoulder.

2 Through and through without fracture, but with small or large shell fragment or a machine gun or rifle bullet, lying either free in the joint (rare except in knee) or embedded in one of the articular surfaces or the diaphysis (shaft) and communicating with the joint.

3 Large wound of entrance or of exit, or both, associated with a fissure in the bone or with more or less comminution of the articular ends.

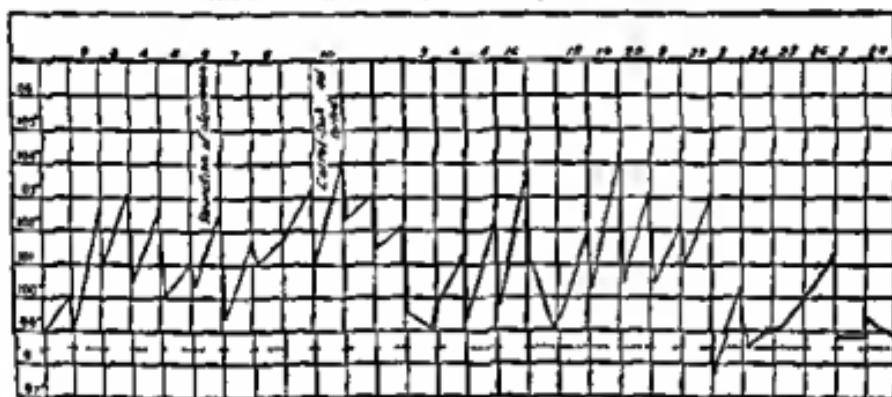
4 Crushing injuries of the articular ends with involvement of the principal nerves and blood vessels of the limb necessitating early amputation.

Treatment of War Injuries of the Joints—The consensus of opinion as to the best method of treatment at the present time is as follows:

Class I—Wounds by rifle or machine-gun bullets fired at a long distance, *i.e.*, without explosive action. (a) With through and through wounds it is best to pursue a conservative course. Do not operate even though there is a fracture into the joint. The joint should be mobilized as soon as reaction ceases and if the bullet is embedded in the bone it is best to remove it after

plicated by a traumatic olecranon bursitis which communicated directly with the seat of fracture and this in turn with the cavity of the joint. I have referred to this in the early part of the clinic as being one of the possible modes of entry of infection in compound joint injury. In order to secure proper access to all parts of the joint for our Carrel instillation tubes the upper fragment of the olecranon was removed and the treatment begun which I will describe more fully in connection with Case III. A glance at the temperature chart (Fig. 151) shows how rapidly we were able to conquer the infection in the joint. At

COMPOUND FRACTURE OF OLECRANON SEPTIC ELBOW JOINT



Dineen (Surg., Gyn., and Obst. 1918 27, 289) and others have had excellent results and strongly endorse the position of Williams. I shall refer later to the application of early mobilization to joint injuries in civil life in connection with Case IV. The third advance in our methods of treatment which this war

has taught us is the Carrel Dakin treatment and I shall describe its use in infected joint injuries in connection with the same case.

Let us now examine the 4 clinical cases and note how the experience of war surgery has been applied in the last two.

CASE I—Compound fracture of olecranon process of right ulna followed by severe infection of elbow joint. Carrel Dakin treatment followed by rapid subsidence of sepsis. Ankylosis of joint.

This man aged forty-one fell upon his right elbow from a wagon about twenty-four hours before admission to the hospital. Upon admission to the hospital the elbow region was found greatly swollen red and very tender. From a wound over the olecranon process there was a constant discharge of turbid

Fig. 150.—Fracture of olecranon process from Case I. Note how line of fracture passes directly into elbow joint, allowing of free communication between surface wound and interior of joint.

serum. X Ray revealed a transverse fracture of the olecranon (Fig. 150) extending into the elbow joint. Every effort was made to combat the infection which already existed but without success. The temperature rose steadily and it was soon apparent that we were dealing with a severe septic arthritis of the elbow. Under anesthesia we explored the region over the upper end of the ulna and found that the accident had been com-



perature chart (Fig. 153) The septic arthritis was of a most severe and resistant type, but the subsidence of the fever and other symptoms of sepsis soon convinced us that we were controlling the infection. In this case the criticism I have to make of our treatment is, first, that we were not more radical in the treatment of the crushed soft tissues, and second, that efforts at mobilization of the elbow were begun too late, the result being that the elbow has, as in the first case, become ankylosed.

I will now show a third case of severe elbow joint injury in which we profited by our experience in the first two cases and

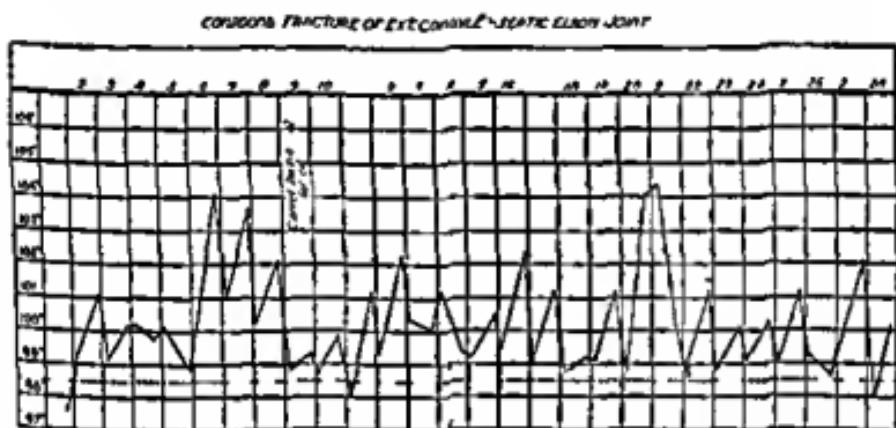


Fig. 153.—Temperature chart from case of compound fracture of external condyle complicated by septic condition of elbow joint.

began active and passive mobilization at an early period after subduing the infection by the Carrel method

CASE III—Male aged forty five, caught in rapidly moving belting and carried to the top of a grain elevator. Crushing injury of right arm necessitating amputation near shoulder. Lacerated wound over left elbow, opening joint widely and followed by severe sepsis. Resection of elbow and Carrel Dakin treatment with rapid subsidence of symptoms. Early mobilization followed by excellent function of elbow. Reeducation of patient.

This man was caught, while working in a grain elevator, in some rapidly moving belting and carried to the top of the build-

This patient (male aged thirty) was run over by a motor truck the wheel passing over the outer aspect of the right elbow. Upon admission an area of contusion was to be seen extending through all the soft tissues from the middle of the radial side of the forearm to the level of the junction of the upper and middle thirds of the humerus on its outer aspect. X-Ray examination revealed a fracture extending from a point above the external condyle obliquely downward through the middle



Fig. 152.—Fracture of external condyle of humerus in Case II. Note how the line of fracture passes directly through the entire surface of the humerus through the elbow joint.

of the articular surface of the humerus (Fig. 152). I advised conservative treatment of the contused area by painting it and the surrounding skin with tincture of iodin and the application of a dry sterile dressing. Had I employed the method of debridement or radical resection of all contused tissues which the present war has demonstrated as of such great value I would have anesthetized the injured man immediately upon admission and have resected all the contused devitalized tissue. This serves as a medium for the growth of pathogenic organisms and proved to be true in our case. The area over

the outer aspect of the elbow began to show evidences of gangrene and the gradual but steady onset of the symptoms of a generalized sepsis showed that the infection had extended through the gate way offered by the devitalized tissue and fracture directly into the elbow joint. Free drainage was provided by resection of the joint surfaces and then several of the instillation tubes to be described in connection with Case III were inserted. The brilliant results secured in this case from the application of the Carrel Dakin treatment are best seen by a glance at the tem

begun. A very inexpensive and easily constructed apparatus (Fig. 157) with which to obtain active mobilization is constructed on the principle of the pulley weight machine so popular in our gymnasiums. Within a few weeks he was able to flex and extend the elbow within the normal range of motion (Figs. 158-161). I was led to begin early mobilization of the



Fig. 155.—Plaster cast used in the three cases of septic elbow joints spoken of little rigidity in cast

joint in this case after reading of the experience of Willems, and the result in this case certainly is a brilliant one compared to our former methods of treatment as seen in the first two cases. We were soon confronted with the problem of how to prevent this man from becoming a burden to himself and to society. I invited one of our occupational therapy

ing. His right arm was so badly crushed that amputation close to the shoulder joint was immediately performed. Over the left elbow was a lacerated wound extending into the joint so that the articular surfaces were visible. I saw the patient for the first time two weeks after the accident and found him extremely septic as the result of a severe infection of the left elbow joint. There was wide-spread suppuration in the soft tissues around the joint extending to the middle of the forearms below and almost to the shoulder in an upward direction. En

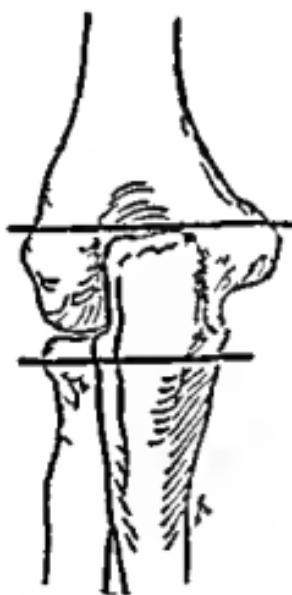


Fig. 154.—Posterior view of elbow joint showing the level of typical resection of elbow joint, an operation which should be seldom performed for drainage of a septic arthritis.

ergetic action was needed to save his life inasmuch as amputation has in my experience not been as efficacious in checking the sepsis as thorough drainage. I immediately resected the elbow (Fig. 154) and injected tincture of iodin into all portions of the joint and as soon as possible inserted several instillation tubes and began the Carrel Dakin treatment. The elbow was kept immobilized temporarily in an interrupted (Fig. 155) plaster cast. The wound healed very rapidly (Fig. 156). About five weeks after the injury active and passive movements were

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Fig. 155.—Plaster cast used in the three cases of septic elbow joints spoken of in text. Note the fact that cast is sold on one side so as to permit of little motion during the early stages of treatment. Also observe how rigidly of cast is maintained by a U-shaped piece of bandage incorporated in cast.

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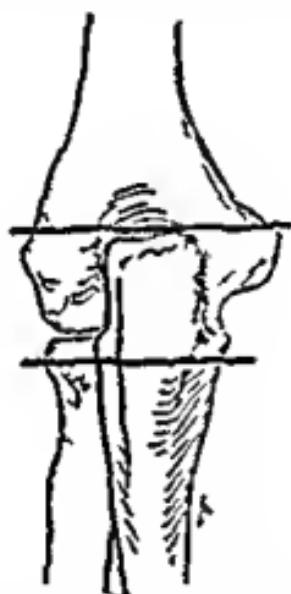


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possesses a high degree of antiseptic power in the presence of tissue proteids. Owing to its hemolytic property one must be careful to secure good hemostasis on account of a possible secondary hemorrhage. The method is not one of continuous irrigation, but rather to deliver to every portion of the wound an antiseptic solution of a known strength. Objections have been raised because a painstaking surgical technic and the co-operation of a competent pharmacist or chemist is required. When one com

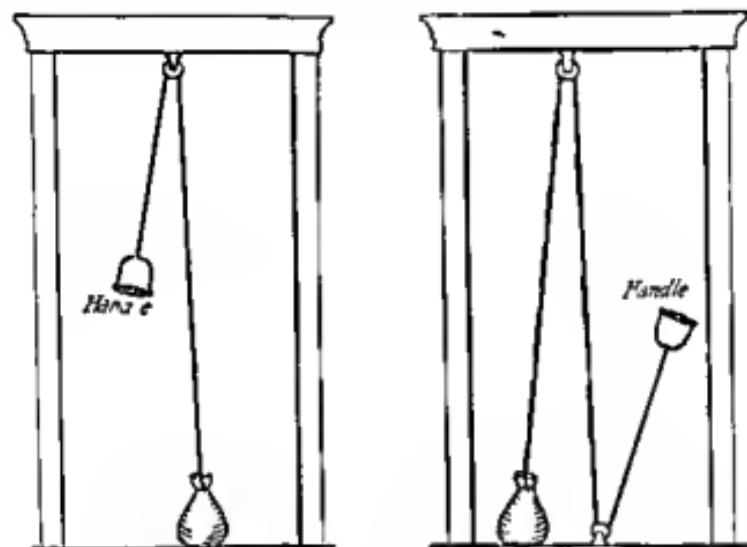


Fig. 157.—Simple apparatus used by author in early mobilization of Case III. This apparatus consists of a pulley inserted into a door frame to one end of which a handle is attached and to the other end a bag of salt weighing from $\frac{1}{2}$ to 2 pounds or more as is desired. The illustration on the left shows how this apparatus can be utilized for mobilizing the shoulder joint and the illustration on the right shows how it can be employed for mobilization of the elbow joint if a second pulley is inserted into the threshold

pares the results however obtained in the 3 cases I have shown with those obtained by any other method I feel confident that we have been richly rewarded. The careful arrangement of the instillation tubes and the necessity for strict asepsis cannot be too strongly impressed upon those who wish to be successful in the application of the method. The progress of sterilization of the wound is observed by the rough but sufficient method of counting the bacteria from smears of as uniform a thickness

teachers Mrs. Sigbee to co-operate. Within three weeks she has taught the patient to write very legibly with his only remaining (left) hand and to weave the baskets (Fig. 167) I now show you. She will tell you later of the work of rehabilitating such handicapped individuals.



Fig. 166.—Side view of Case III showing wound on posterior aspect of elbow joint.

Before presenting the fourth case I desire to describe very briefly the principles and mode of application of the Carrel Dakin treatment.

The Carrel method makes use of a 0.45 to 0.5 per cent solution of hypochlorite of soda (Daufrèsne Dakin formula) the causticity of which has been thoroughly neutralized. It

For further detail see book by Carrel and Dehelly.

which has not been sterilized. The materials employed in the application of the method are

1 A solution of 0.5 per cent sodium hypochlorite prepared by the Daufresne formula

2 An amber flask¹ of 500 to 1000 c.c. capacity with rubber tubing to carry the fluid to the distributing tubes, which are of various types (Fig. 163)

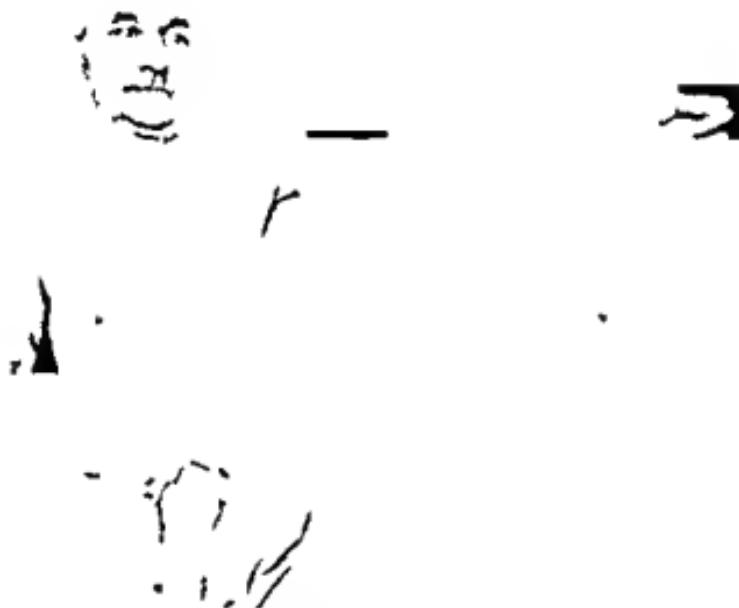


Fig. 159.—Front view of Case III showing ability of patient to completely extend elbow joint

3 A Murphy glass drip bulb to note the rate of flow of the solution with a pinch cock on the rubber tubing (Fig. 164)

4 Instillation rubber tubes tied at the end with lateral openings made with a special punch. If one wishes to make these rigid a piece of silver wire can be inserted. The above equipment is now kept in stock by every instrument house and methods

¹ Many prefer to use a glass syringe with a large rubber bulb so as to force the fluid through under pressure.

as possible and in fields of uniform size. If the number of bacteria decreases to less than one per five fields, and continues so for five successive daily counts the wound may be considered sufficiently sterile for a secondary suture to be done. Often weeks to months are saved by this latter method which consists



Fig. 128.—Front view of Case III showing ability of patient to completely extend elbow joint.

in either resecting the edges of the granulating surfaces and approximating them by sutures or in resecting not only the edges but also the entire granulating surface before suturing. I prefer the first named of these methods of secondary suture. If the count is temporarily reduced by the Carrel method or remains persistently high one must suspect the presence of a focus

which has not been sterilized. The materials employed in the application of the method are

- 1 A solution of 0.5 per cent sodium hypochlorite prepared by the Daufresne formula
- 2 An amber flask¹ of 500 to 1000 c.c. capacity with rubber tubing to carry the fluid to the distributing tubes which are of various types (Fig. 163)

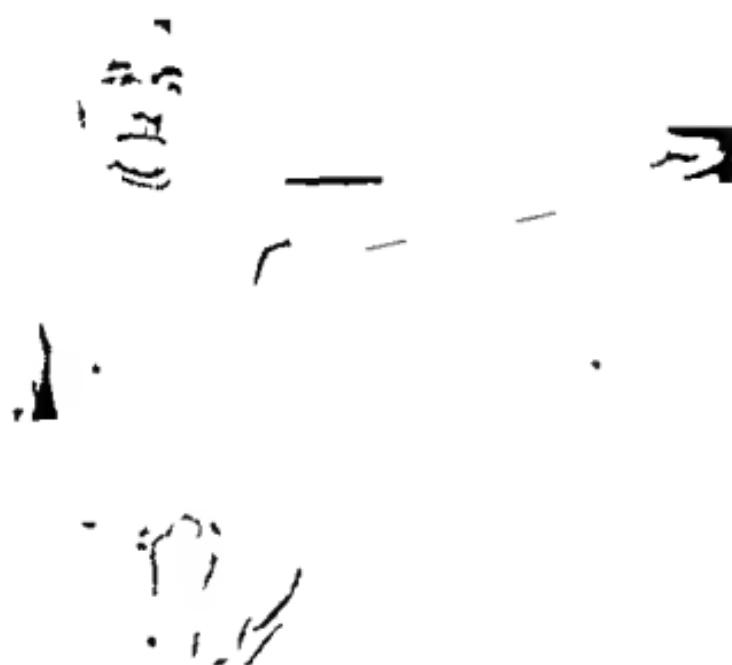


Fig. 159.—Front view of Case III showing ability of patient to completely extend elbow joint.

3 A Murphy glass drip bulb to note the rate of flow of the solution with a pinch cock on the rubber tubing (Fig. 164)

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¹ Many prefer to use a glass syringe with a large rubber bulb so as to force the fluid through under pressure.



Fig. 160.—Side view of Case III showing degree of voluntary flexion of the elbow joint. Note practically complete normal flexion of the joint.



Fig. 161.—Front view of Case III showing degree of voluntary flexion of the elbow joint. Note practically complete normal flexion of the joint.

have even been perfected by which the making of the solution has been greatly simplified

Instillation of the fluid is made every two hours either with the fluid from the bottle (Fig 164) or with a special glass syringe with a large rubber bulb, the object being to distribute it to every corner of the wound. In order to prevent any irritation the adjacent skin for a distance of 4 to 5 inches is covered with gauze impregnated with a mixture of vaselin 91 parts, paraffin 6

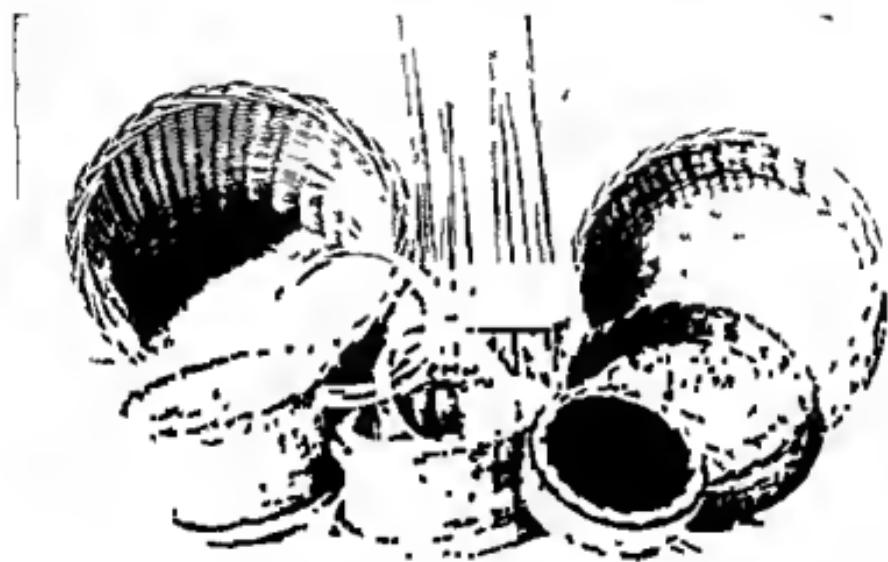


Fig 162.—Baskets made by patient (Case III) after three weeks of instruction by vocational teacher

parts, and resin 3 parts. For surface wounds the end of the tube is covered with a layer of turkish toweling. For joint wounds (Fig 164) or infected compound fractures a number of instillation tubes are inserted so that the solution may be constantly in contact with every portion of the infected area. Time will not permit of a more detailed description of the Carrel method, but I have had ample opportunity to test its efficacy in a number of infected cases during the past year.

CASE IV.—Incised wound (made by a piece of glass) of left

hand with involvement of extensor tendons of index and middle fingers and compound dislocation of the metacarpophalangeal joint of the index finger. Resection of wound edges followed

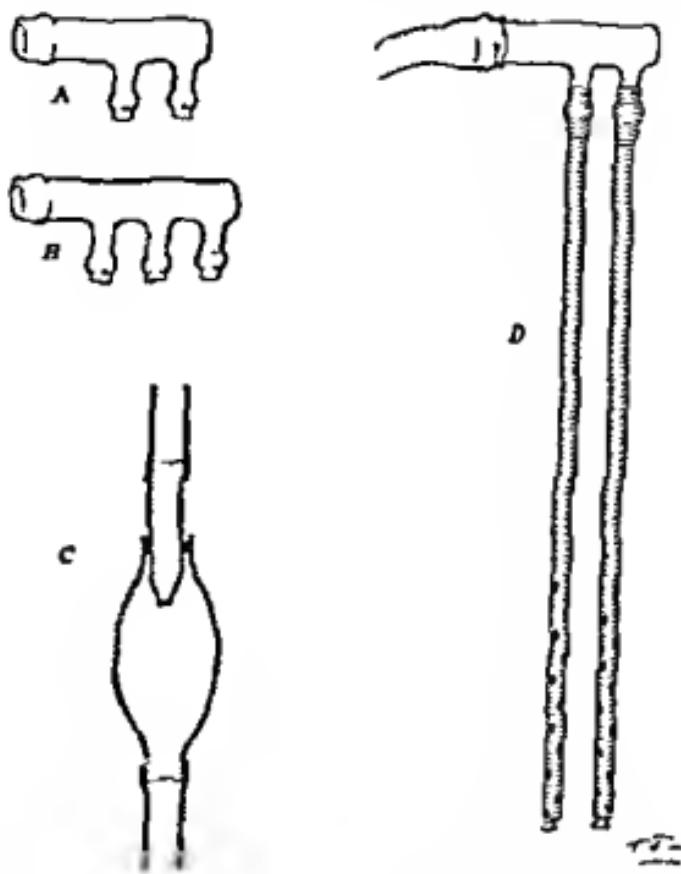


Fig. 163—Carrel Dakin tubes, etc., used in application of Carrel Dakin method. *A*, Glass tube having two outlets. *B*, Glass tube having three outlets. *C*, Murphy drip tube to note rate of flow of solution. *D*, Two rubber tubes such as were used in cases spoken of in text. A silver wire is first placed in the lumen of each tube before tying the tail end of tube with silk. The object of the silver wire is to keep the tubes rigid. Note multiple openings in tubes to permit easy escape of the solution.

by suture of tendon, joint capsule and skin (primary suture). Healing by first intention. Excellent functional result.

At the beginning of this lecture I referred to the great advances in the treatment of wounds, which had been accomplished

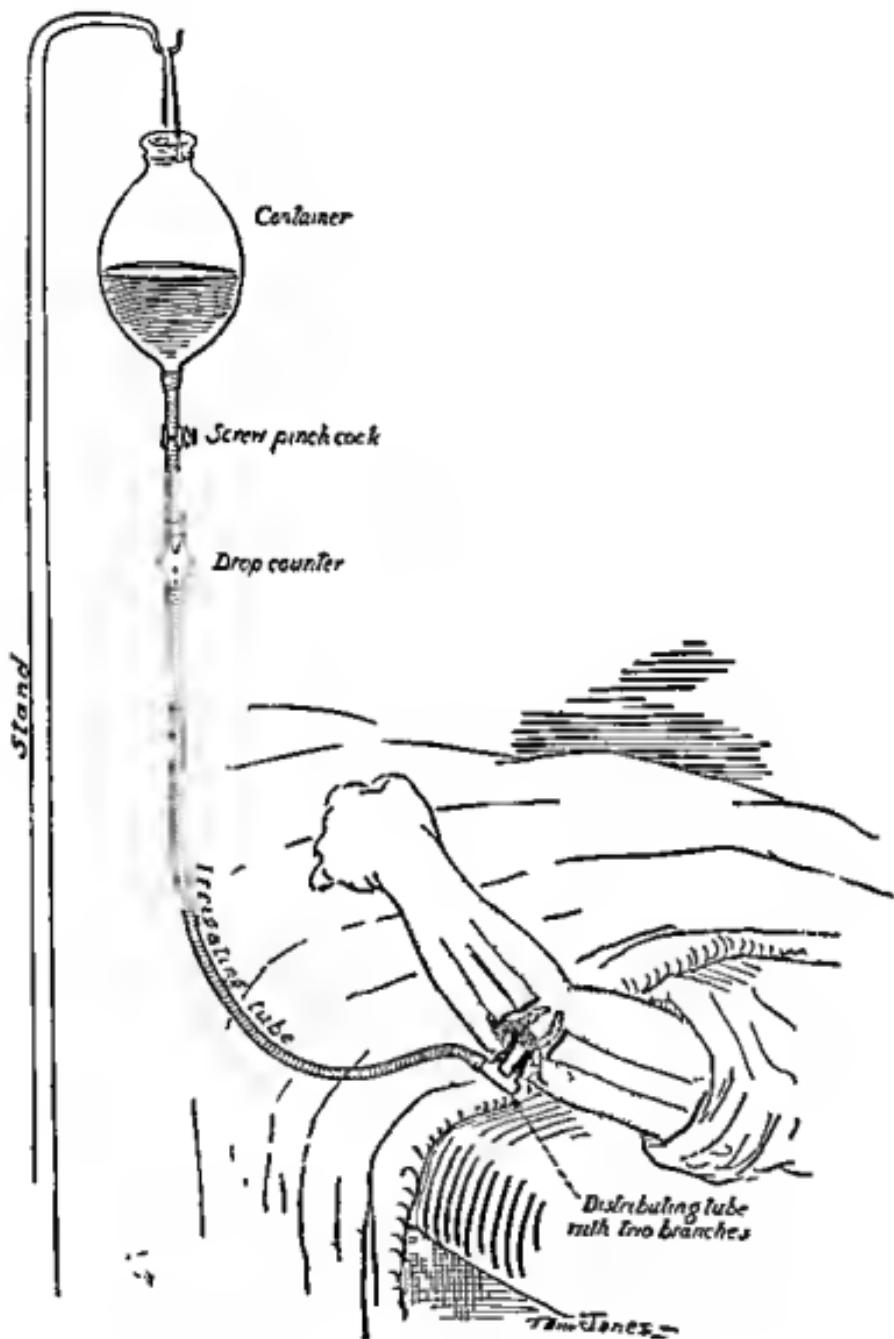


Fig. 164.—Method of using Carrel-Dakin solution in case of septic arthritis
(See also Fig. 163.)

during the present world war, especially since the introduction of primary, primary delayed, partial primary, and secondary suture technic. The aim of these newer methods is to utilize the natural defenses offered by the body fluids and tissues : *e*, of the bactericidal action of the blood serum and leukocytes in subduing infection. Infection, as I have previously stated, begins within six to eight hours after an injury, hence if cases are seen even within the first fifteen hours we can still do a primary suture or at least a partial one. If we are not sure of the wound being clean, it is best to wait and take daily cultures. If these show no growth especially none of hemolytic streptococci, we can do delayed primary suture at the end of three to five days. In 890 cases recently reported by a French surgeon Lemaitre, 80 per cent healed by first intention when a complete primary suture was done within twelve hours after receipt of the injury, 6 per cent had the same result by primary delayed and 9 per cent by secondary suture. You can readily see what an uncalculable saving this means in placing soldiers back on the firing line.

CASE V illustrates how I applied this method of primary suture to an injury in civil life. A boy aged fourteen entered the hospital two hours after being cut across the dorsum of the left hand by another boy with a piece of glass. Examination revealed a widely gaping incised wound extending from near the base of the dorsum of the thumb across the hand to the ring finger. The capsule of the metacarpophalangeal joint of the index finger had been extensively divided and the extensor tendons of this and the adjacent middle finger severed, so that a compound dislocation had taken place at the metacarpophalangeal joint. Under anesthesia we resected the torn skin tendon and capsule edges so as to eliminate all devitalized tissue. The wound in the capsule was sutured with fine chromic catgut after the dislocation had been reduced. The severed tendons were next united and finally the freshened skin edges approximated without drainage of the wound. The result is as you can observe, a perfect one. Healing has occurred by first intention and now at the end of one month thanks to early

mobilization he can extend and flex the fingers within the normal range of motion. This case illustrates an application of one of the lessons of the present war, viz primary suture of accidental wounds. In closing let me again direct your attention to the great value of the other two methods which today's cases have illustrated, viz, early mobilization of injured, especially of infected joints and of the Carrel method.

Before closing the clinic I have asked Mrs Sigsbee, of the Staff of teachers of the Favill School of Occupational Therapy to give you a brief description of this new field of work.

THE PRINCIPLES UNDERLYING REHABILITATION AMONG THE HANDICAPPED¹

One of the great benefits to humanity growing out of the calamity of war will be the reclaiming of our vast army of handicapped men. After previous wars the men who were left maimed were awarded medals of honor given meager pensions and left to face life as best they could. We have now come to realize that this does not discharge a nation's debt to its heroes.

England estimates 30 000 permanently disabled in each 1 000 000 after a year's service. With such stupendous numbers we can no longer fail to see the economic value of utilizing what in the past has been considered waste material. It is not conducive to a healthful state mentally morally or physically that our returned men should spend their remaining days in idleness. It is of mutual benefit to the individual and the state that his productive capacity be restored and that he return to civil life feeling once more that he is a necessary factor in the activity of the community.

There have been many attempts to establish schools to retrain civilian handicapped populations but it remained for a trade school at Charleroi Belgium to bring this work to prominence and success. This school was destroyed by the German invasion but its teachers and pupils were scattered into France where their knowledge and experience proved of the greatest

¹ Remarks at close of Dr Esendrath's clinic on Joint Injuries by Mrs Mann S Sigsbee

value. The Ecole Joffre at Lyons became the model and hundreds of centers are now established in all the warring nations. Germany had laid a most solid foundation for the restoration of her returned men. Within a week after hostilities began, her resources were organized for the rehabilitation of her crippled.

Rehabilitation and then re-education are worked out by very carefully developed steps each department of the work being interrelated. The first responsibility rests upon the surgeon, who must work to conserve every possible unit of the man's capacity, the muscles and joints must be restored as far as possible, and the man brought to good general health. To replace amputations the most improved artificial limbs are substituted, and these the men must learn to use with facility. Interchangeable appliances are many in type, chosen according to the trade in which the man is to engage. It is primarily the lost function rather than the lost member which they will strive to replace.

The curative agency of work is an unquestioned fact, so that now we pass on to the second stage of rehabilitation. Functional restoration is carried on by medical electricity, massage, systematic physical exercise, and occupational therapy, which is begun before the patient has left his bed. Great importance is placed upon stimulating the man's interest at the earliest possible period, thus helping to tide him over a critical period of discouragement and prevent his lapsing into habits of idleness. Discipline is also much easier to maintain when the men are occupied with some wholesome task. This first occupational work should be diversional curative and if possible lead to the vocational training which now follows.

Previous to this point the man's former working experience has been recorded. Unless his injury prevents, he will return to his former occupation or to some allied trade where his past knowledge may be conserved. If his handicap is such as to prevent this or if he has not previously attained a permanent placement in the industrial world he will be provided with a thorough training along another line. Trade schools commercial

schools, and colleges will co operate with the government in this work

Very careful consideration is given to the selection of the work into which a man is to enter. He receives the advice of officers thoroughly conversant with industrial problems. Each man is studied individually, his disability, personal tastes, and temperament taken into consideration, and the employment possibilities of the trade taken into account—that they be growing industries, offering steady employment, and a good standard wage.

Some of the preferable trades are agriculture, motor mechanics, electrical trades, making of artificial limbs, printing, cobbling, tailoring, mechanical drawing, and oxyacetylene welding—many will elect to enter commercial courses. Placement of the men in jobs will be made by local agencies.

Now comes the test of the re-educating system. Only a most thorough training will stand the test, and the man's future welfare depends upon his being held in training until he is thoroughly skilled in his chosen line of work. He thus enters into active life with a confidence that universally spells success.

This will be the record of our returned heroes. They will have climbed the slow, hard road to recovery and have proved themselves as truly heroic in facing the problems of life as they did in facing death. This system will reach out and reclaim our handicapped civilian population. We will hope for the time when there will cease to be the cripple, when even the term will fall into disuse.

CLINIC OF DR BENJAMIN F DAVIS

PRESBYTERIAN HOSPITAL

CYST OF THE URACHUS

Summary Differential diagnosis of subumbilical space infection umbilical concretion persistent vitello mesenteric duct and patent urachus demonstration of urachal cyst at operation—discussion of the pathologic anatomy symptomatology diagnosis and treatment of cysts of the urachus

THIS patient is thirty three years of age. He was perfectly well up to two years ago this coming August, at which time he was greatly annoyed by a very foul, whitish discharge from the umbilicus associated with a dull continuous ache in the umbilical region. This was especially noticeable on very hot days but did not leave him entirely until the onset of cooler weather in late September. He was then free from trouble until the next summer, when during a very hot spell, the foul discharge and diffuse para umbilical pain reappeared and annoyed him more or less continuously until cool weather again came to his relief. During this time frequent bathing with particular attention to the cleaning of the umbilicus, failed to give any appreciable benefit. Yesterday he was again seized with pain about the umbilicus, the fetid umbilical discharge has been present on this occasion for a week or more. Unlike previous attacks the pain has gradually increased in severity, the patient walked into the hospital about an hour ago doubled over with pain and begging for relief. He has not vomited. His bowels have moved regularly every day.

Examination reveals a strongly built man who appears to be suffering severely. He lies on his side with the knees drawn up and the body flexed. The eyes react to light and accommodation, the head neck mouth, and pharynx are normal, heart and lungs clear, the extremities negative, urine normal, leukocyte count

12 000 On inspection of the abdomen we notice two things there is a slight discharge from the umbilicus and the region immediately surrounding the umbilicus is slightly raised so that the umbilical orifice occupies the relative position of the crater of a volcano. There is no discoloration of the skin of the abdomen not even an erythema about the umbilicus and the abdominal muscles in general are moderately relaxed in no way suggesting the rigidity so commonly noted in the presence of wide spread acute intraperitoneal inflammation. We note also that the discharge which moistens the umbilicus has a peculiarly penetrating *disgustingly rancid odor*. On palpation the abdominal muscles in general are soft and there is no muscle spasm under the examining fingers. About the umbilicus however the abdominal wall is hard and the patient complains of even the lightest touch. The umbilicus itself is unusually deep and funnel shaped introducing a probe we can pass it a distance of $1\frac{1}{2}$ inches beyond the apparent bottom of the umbilicus in the direction of the symphysis pubis without however releasing any fluid or in any way relieving the pain. We are apparently therefore dealing with some process in a tissue which is associated with but is not a part of the umbilicus unless the latter is in this instance extraordinarily deep and hour glass in shape.

There are several possibilities to be considered here from the standpoint of diagnosis. First infection of the subumbilical space. The subumbilical space is a definite heart shaped cavity about 8 cm in length and 14 cm in breadth lying below the umbilicus which can be definitely outlined by injection methods. It is situated between the peritoneum and the sheaths of the muscles and is often divided longitudinally into two cavities by the linea alba which forms a septum between the muscle sheath in front and the peritoneum behind. As stated by Cullen there is no doubt that subumbilical abscesses can develop. The symptoms in the early stages strongly suggest peritonitis later the general abdominal symptoms subside and a localized tumor can be detected just below the umbilicus. When opened the abscess is found to be between the muscle sheath and the

peritoneum. Usually the septum between the two sacs disappears leaving only one abscess cavity.

Against the diagnosis of abscess of the subumbilical space in this case we have the absence of signs of general peritonitis at any time during the disease, the presence of a discharge from the umbilicus preceding and also coincident with the pain, and the history of previous attacks of this peculiar trouble apparently occurring at a time when the secretory activity of the skin was at its height, namely, in very hot weather.

A second possibility to be considered is that of umbilical concretion. Again quoting from Cullen, we may state that, as a rule, a patient with an umbilical concretion is unaware of any trouble until abdominal pain is felt. This is usually referred to the umbilical region, and may be increased on muscular exertion, on defecation, or on pressure on the abdomen. On visual examination sometimes nothing is detected. Later, induration is noted in the umbilical region, the umbilical opening becomes very small, and the surrounding tissue feels hard. The overlying skin may or may not be reddened. At this stage the patient may have excruciating abdominal pain, followed by the escape of a foreign body, together with some blood and pus. A speedy disappearance of the symptoms usually follows. The cause of these umbilical concretions with the associated inflammation is easy to explain. Owing to the lack of cleanliness or to an unusually deep umbilicus particles of hair or wool accumulate deep in the umbilical depression. These form a small ball which, in turn by its irritation causes exfoliation of the squamous epithelium. This adheres to the mass and gradually increases its size. Finally, as a result of constant irritation, there ensues a mild inflammation of the tissue surrounding the umbilicus which gradually narrows the umbilical opening until it becomes but little larger in diameter than a fistulous tract. Pus accumulates and dilates the umbilical depression, and an abscess cavity containing a concretion results.

In general, this description fits our case very well, but there are several points against accepting the diagnosis. First, the umbilical orifice here is not contracted, second, the umbilicus,

while deep and funnel shaped, can be explored to the level of the linea alba without exposing any pathology, third, a probe can be passed 1½ inches caudalward beyond the bottom of the umbilical depression and seemingly beneath the plane of the linea alba. We must, therefore, search further for a diagnosis, and at once there comes to mind the possibility of the persistence of some of the structures which find exit at the umbilicus in the embryo. We may be dealing with a persistent vitello-mesenteric duct or a remnant of the embryonic allantois. I believe that we can rule out the former on the following basis. If there were complete patency of the vitello-mesenteric duct, the discharge would have been present since infancy and would be fecal in character—not the highly rancid discharge of decomposing sebum, if only the distal portion of the duct had remained patent, the discharge would have been present since infancy, would be mucous in character, since such remnants are usually lined with intestinal epithelium (occasionally, gastric epithelium), and would be fairly constant, moreover, a patent vitello-mesenteric duct would not lead an exploring probe caudalward but more or less directly dorsalward. There is therefore, but one thing left for consideration, namely, patency of the umbilical end of the urachus. This is very strongly suggested by the results of exploration with a probe, and if we imagine a sac at the upper end of the urachus communicating with the umbilicus through a small opening, we can readily picture the formation of a concretion in such a sac and the development of symptoms in every way similar to the umbilical concretions which we discussed a moment ago. We therefore accept the tentative diagnosis of cyst of the upper end of the urachus.

Now what shall our treatment be? We are told that as a rule, dilatation of the umbilicus and removal of the stone is all that is required in the treatment of umbilical concretions. In this instance, however, the pathologic condition which we wish to remedy lies beneath the linea alba, we do not know its extent and, while dilatation might give temporary relief, contraction of the ring with recurrence of symptoms at a later date is almost certain. We will, therefore, operate with the intention

of removing completely any pathologic tissue. Under novocain anesthesia I make a midline incision about 4 inches in length which splits at its center to encircle the umbilicus. The umbilicus is skeletonized without great difficulty except when

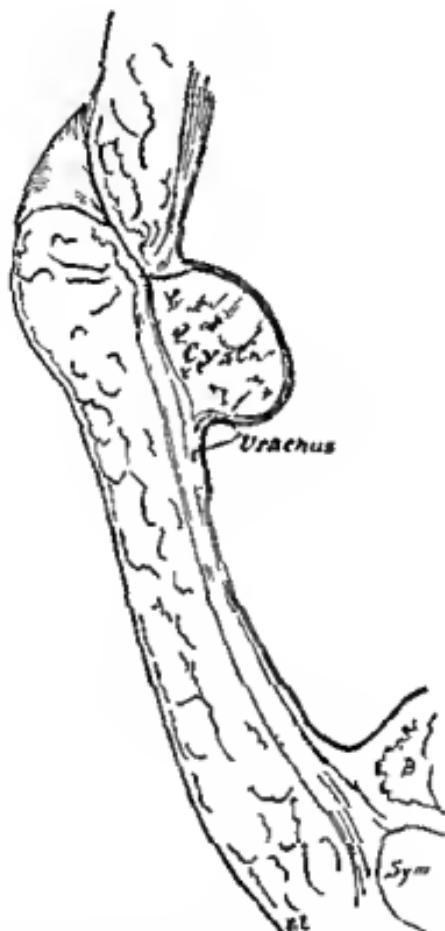


Fig. 165.—Longitudinal section of midline of anterior abdominal wall illustrating the relation of the cyst to the umbilicus, the urachus, the linea alba and the peritoneum.

traction is made on it at this the patient complains of intense pain of the old type. We have now exposed the linea alba and find as we had expected that the umbilicus is continuous through it with some bulbous structure. Manipulation of the umbilicus is so painful however and the pain is apparently so beyond con-

trol of a local anesthetic that we give this patient a few whiffs of ether for the completion of the operation. With the patient lightly anesthetized, I incise the linea alba, beginning my incision at the point of emergence of the umbilicus and continuing it downward a couple of inches. Immediately there comes into view this globular structure, about as large as the terminal phalanx of my thumb, continuous with the umbilicus above and tapering off caudalward into this white, round cord about 3 or 4 mm. in diameter, which is undoubtedly the obliterated urachus. This structure lies between the peritoneum and the fascia of the anterior abdominal wall and is very easily lifted from its bed (Fig. 165). I cut the urachus about 1 inch below its enlarged upper end, its cavity is entirely obliterated at this level. You will observe that all this dissection has been extraperitoneal. I close my incision in the usual manner with silkworm-gut tension sutures, catgut for fascia and silk for skin, leaving a strip of guttapercha tissue in the wound for drainage.

Note—A rather severe infection with an odor resembling that of the discharge from the umbilicus before operation developed in the wound, but rapidly cleared up, and the patient left the hospital two weeks later with the wound entirely healed.

As I incise this mass which I have removed, a few drops of pus ooze out, and then I free a friable concretion which readily crumbles under light pressure by the fingers. We find that the epithelium lining the umbilical depression terminates abruptly at about the level of the constriction produced by the linea alba and the interior of the sac is lined by granulation tissue (Fig. 166).

Note—This was later confirmed by microscopic examination.

It will not be amiss here to say a few words on the subject of urachal cysts. Minute cysts appear to be fairly common. Thus Untz (Virchow's Archiv, 1883, xcii, 387) examined 74 bodies in a search for such lesions, and found them in 24 out of the 74. Clinically, they are much less common. Weiser (Annals of Surgery, 1906, xli, 529) analyzed 89 cases which he culled from the literature, including 19 so-called allantoic cysts,

which by some are thought to have been examples of localized pelvic tuberculous peritonitis. In the majority of cases the patients were adults and there were three times as many females affected as males. According to Weiser urachal cysts are found in the midline between the umbilicus and pubes. They may be soft and fluctuating resembling a distended urinary bladder or firm and apparently solid. There may be pain in the lower part of the abdomen—this is usually from an associated local

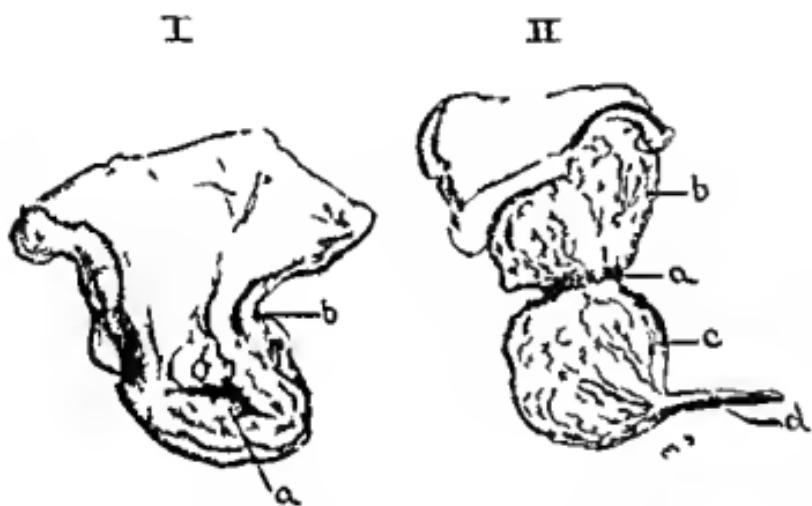


Fig 166—Cyst of urachus. I View from cephalic side umbilical pouch slit open. a Communication with exterior through depths of umbilicus. b zone of constriction in linea alba. II Lateral view. a Constriction at zone surrounded by dense fascia of linea alba. b umbilicus external to linea alba. c subaponeurotic pouch and cyst. d continuation of urachus not patent.

peritonitis as in many instances the cysts are unnoticed until they in some way become infected. They may imitate an cysped peritonitis especially of tuberculous origin and ovarian cystadenomas. In general any or all of the following symptoms may be found (Uritz).

- 1 Mass between umbilicus and symphysis pubis
- 2 Feeling of illness
- 3 Loss of weight

4 Abdominal pain

5 Fever—often

6 Gastro intestinal disturbances

7 Emaciation

8 In 10 per cent of cases a discharging sinus at the umbilicus

To this list we may add the following hints (Dosebber Beitr z Klin Chir 1893 v p 102) Urachal cysts do not always appear in the median line they may be displaced to one side or the other. They may reach great size and be confused with other tumors particularly ovarian cysts. The cyst wall is composed of dense connective tissue in which smooth muscle fibers may be found. The epithelium lining the cyst is usually of the transitional type. The cyst contents usually consist of a thin fluid but are not urinary. Hemorrhage may occur in such cysts and produce symptoms similar to those of torsion of the pedicle of an ovarian tumor.

We may summarize the diagnosis as follows (Cullen: The Umbilicus and Its Disease 1916) Urachal cysts have been diagnosed as (1) distended bladder (2) ascites (3) appendicitis with abscess formation (4) ovarian cyst with or without twisting of the pedicle (5) localized peritonitis with serous exudate under the anterior abdominal wall (6) tuberculous peritonitis.

The distended bladder is readily emptied and the ascites relieved by paracentesis. With the patient asleep it is relatively easy to outline the cyst and to differentiate it by the absence of the induration usually associated with an appendix abscess. Furthermore with the abscess there is more likely to be a history of an elevation of temperature and of a definite leukocytosis. An ovarian cyst whether mobile or twisted lies much further back in the abdomen and can be separated from the abdominal wall particularly when the patient is under ether. The differentiation from a localized peritonitis or from tuberculous peritonitis is not so easy particularly when the patient has become emaciated. Even in these cases however the patient is asleep the sharp outlines of the urachal cyst are readily distinguishable from the rather diffuse cyst of the peritonitis occurring with a peritonitis. Again in the case

cyst moving it from side to side is likely to produce traction on the umbilicus. With an aspiration needle one can readily remove some of the cyst fluid and thus usually settle the diagnosis.

The treatment of urachal cysts is by excision—sometimes quite a simple procedure as the cysts are always extraperitoneal. Occasionally in the case of a large cyst or one in which there has been inflammation excision may be rendered difficult and dangerous by the involvement of the peritoneum and by adhesions through it to the abdominal viscera.

In conclusion permit me to say a word regarding the incision which I have used here. It was as you observed longitudinal. As a general proposition transverse incisions are best in operations about the umbilicus which are carried through the aponeurosis. It has been clearly demonstrated at the Mayo Clinic that transverse incisions in this location permit much the firmer and safer closure. The longitudinal incision seemed more desirable here because I did not know how far toward the bladder the dissection might have to be carried and it seemed possible that a transverse incision might not allow sufficient exposure.

- 4 Abdominal pain
- 5 Fever—often
- 6 Gastro-intestinal disturbances
- 7 Emaciation
- 8 In 15 per cent of cases a discharging sinus at the umbilicus

To this list we may add the following hints (Doebeber *Beitr z Klin Chir* 1893 v p 102) Urachal cysts do not always appear in the median line they may be displaced to one side or the other. They may reach great size and be confused with other tumors particularly ovarian cysts. The cyst wall is composed of dense connective tissue in which smooth muscle fibers may be found the epithelium lining the cyst is usually of the transitional type the cyst contents usually consist of a thin fluid but are not urinary. Hemorrhage may occur in such cysts and produce symptoms similar to those of torsion of the pedicle of an ovarian tumor.

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CLINIC OF DR GUSTAV KOLISCHER AND DR J S EISENSTAEDT

MICHAEL REESE HOSPITAL

TUMORS OF THE URINARY BLADDER

Summary Presentation of 3 patients illustrating the character of symptoms and endovesical appearances of benign and malignant bladder papillomas and carcinoma of the prostate ulcerating into the bladder treatment—superiority of fulguration, radiotherapy and diathermy over cutting operation, value of cystostomy and nephrostomy, prognosis.

THIS patient reports that about two years ago, feeling an unusually imperative desire for urinating, he picked up his night vessel and to his surprise noticed that the urine voided was stained a dark red. After the full urinary stream stopped and the usual contractions of the perineal musculature were started in order to express the last drops out of the bulbous clear liquid blood dribbled out of the penis. The patient had a good night's rest and the urine passed after awakening was clear in a general way just showing a few fine dark filaments evidently blood coagula. After twenty four hours even those disappeared and the urine remained clear for quite a long time. No unusual subjective symptoms molested the patient.

Hemorrhages as above described have become more frequent during the last three months and the patient alarmed by this experience came to seek professional advice although no perceptible changes in his general well feeling were noticed by him.

The urine passed in our presence is clear and emanates the normal aromatic odor.

Its reaction is acid and a centrifugalized specimen shows under the microscope nothing but some bladder epithelia and a few red blood-cells. The patient gives a negative history as to

running close to the surface through the filigree work of the papillomata, while the presence of a few red cells found in the urine during the free intervals may be explained by diapedesis through the thin walls of these superficially located blood vessels.

The thinness and pliability of the growth, the smoothness of its surfaces, and the lack of infiltration at its base account for the scarcity of subjective symptoms and for the tolerance of the bladder toward instrumentation and distention. Inasmuch as two other bladder cases also suspicious of tumors are to be demonstrated, the discussion of the therapy will be reserved for a cumulative presentation.

The next case concerns a man of forty five years who also recounts that for the last two years he has been subject to recurrent attacks of hematuria. While in the first year the subjective symptoms were not very bothersome, during the last twelve months or so the hematuric attacks have not only become more frequent, but the bladder and its appendages have become the source of practically permanent annoyance. The patient is always conscious of his bladder, the vesical region is the seat of a sensation of heaviness and unusual warmth, occasionally lancinating pains shoot through it and irradiate into the rectum and perineum, each urination is more or less painful inducing the patient to all kinds of manipulations in an attempt to find relief squirming with the pelvis, milking of the penis, and so on. Occasionally it is very hard to start the urinary stream until finally, calling into activity all accessory muscles, a coagulum is forced out of the urethra, which is followed by urination, the last act of which again is marked by pain and spasmodic contractions of the perineal musculature. The urine is cloudy and carries lots of darkly stained coagula, it still is faintly acid, but its odor is slightly foul. Chemical and microscopic examination reveals the presence of traces of albumen, numerous red blood-cells, fresh and in all stages of decay, lots of pus cells, and nondescript débris.

The introduction of the catheter for the purpose of flushing and distending the bladder is perceived by the patient as very painful when its tip passes the posterior urethra. In order to

venereal infection and there are no evidences of such to be found at our present examination. In order to determine the origin of the hemorrhages reported we will proceed to the ocular inspection of the bladder.

The catheter, introduced for the purpose of emptying the bladder first and then to distend it with sterile water for the purpose of cystoscopy, passes smoothly through the urethra, the same being true of the following introduction of the cystoscope. The inspection of the interior of the bladder reveals normal conditions in the vertex and in the fundus, the mucosa shows the proper yellowish gloss, the ramifications of the superficial blood vessels are to be seen very clearly. The same is observed in the base of the bladder, but located about 1 cm centrally from the right ureteral opening there rises a flat stalk of about 5 mm width and of a thickness somewhat under this measurement. This pedicle emerges straight into the cavity of the viscous, has a glossy surface, and is transparent, the blood vessels permeating the bladder fundus are visible right through it. Blood vessels embedded in this stalk and running parallel to its longitudinal axis are distinctly viewed and recognized as arteries and veins by their respective red and blue coloring. About 3 cm above its basic insertion this stalk divides itself up into numerous ramifications, showing the same characteristics as to gloss, transparency, and identification of blood vessels as the stalk itself. The free ends of these arboreous ramifications are thinned out to fimbriated tops, but even the edges of those do not show any signs of breaking down, and the continuance of the contour is maintained. Movements of the cystoscope or the respiratory motions producing "undulations in the fluid distending the bladder make the stalk and the divided leaves" crowning it sway to and fro like the branches of a water plant. Here you see a classic example of a papilloma of the bladder without any manifestations of malignancy—no infiltration or hemorrhages around the base of the pedicle, the pedicle narrower than the crown of the tumor, the epithelial covering of the whole growth intact, no signs of breaking down. It is easily understood how copious hemorrhages may occur due to a rupture of these rather large blood vessels.

terior urethra must be ascribed to the congestion around and near the outlet of the bladder. The frequency and abundance of the hemorrhages are due to the breaking down of the summit of the growth and the subsequent erosion of the blood vessels.

The albumen in the urine is due to the presence of blood and pus produced by the decaying of the tumor.

The next case to be examined and demonstrated concerns a man of about fifty six years of age. Without any cause known to the patient, about a year ago quite suddenly, rather severe symptoms of dysuria set in. At first he noticed that the urinary calls became very frequent, especially so during the night. At each act only small quantities of urine were voided pretty soon micturition became painful, the pain noticed mainly in the vesical region, then the pain became constant only slightly relieved by urination. Later on repeated hematuria was observed in the last few months the urine assumed a fetid odor and carried solid pieces. In the last week the patient has had to urinate every few minutes expressing, under agonizing pains a few teaspoonfuls of turbid or bloody urine, each micturition followed by a regular delirium of the bladder the spasmodic contractions of which cause exquisite suffering. In order to make a satisfactory examination of the bladder in such a case the sensibility of the patient has to be obtunded by morphin. This is preferable to general anesthesia because it requires a very deep anesthesia to make the bladder tolerant—the bladder is known as the ultimum moriens—and the influence of the anesthetic on the kidneys has to be feared in a case of this kind.

The best way to administer the morphin is by inserting into the rectum a suppository carrying $\frac{1}{2}$ grain of the drug. Inside of ten minutes the patient is sufficiently under the influence to permit flushing of the bladder and distention of the viscus by the minimum of fluid necessary for successful cystoscopy.

You will notice that it takes quite a number of flushings to make the fluid return clean enough to permit of cystoscopy. The hand governing the piston of the syringe feels a rigid resistance when the injection reaches about 75 c.c., indicating that

spare the patient suffering and ensure tolerance for the distension of the bladder we inject into it about 10 c.c. of a 4 per cent. antipyrin solution which inside of ten to fifteen minutes produces analgesia sufficient for the execution of a cystoscopic examination. The use of cocaine or similar alkaloids is better avoided in cases in which we have to expect to encounter raw surfaces which may lead to rapid absorption and the dangers of cocaine poisoning.

The ocular inspection of the bladder shows the top and fundus of the bladder intact, only a pronounced injection of the blood vessels is to be observed. When the beak of the cystoscope is turned downward it is discovered that the trigonal mucosa is slightly edematous and permeated by dark red patches of irregular shape, submucous hemorrhages some of them being of older date are almost black. Into the lower left quadrant of the bladder is seen to protrude a globe-shaped body, the top of which carries a depression the edges of which are irregularly serrated flakes of a dirty white color attached to them waver in the filling fluid, the bottom of this loss of substance is covered with phosphates glistening in the light. This globe is carried by a pedicle of the diameter of a lead pencil the basis of which is implanted in the center of the trigonum. Around this base the mucosa is elevated in thick folds has lost its sheen and no blood vessels are to be seen a big bright red blotch surrounds it marking a recent submucous hemorrhage. The edema around the base of the pedicle and the hemorrhagic patches in the mucosa point to an invasion of the adjacent tissues by the tumor and subsequent interference with the circulation. The breaking down of the mass on its top is due to the retrogressive changes common in malignant tumors. Considering that the pedicle is still markedly differentiated from the top and of a smaller diameter the supposition is justified that this tumor was originally a pedunculated papilloma that as happens so frequently, turned into a pronounced malignant growth.

The bulkiness of the tumor the interference with the circulation, and its raw surface on top explain very readily the accentuation of the subjective symptoms during the latter period of its existence, while the exaggerated sensitiveness of the pos-

siderable amount of residual urine. The urine is slightly turbid, faintly acid, and contains a few rusty looking coagula. An unusual length of the catheter has to be introduced before the urinary flow is started, proving an elongation of the posterior urethra pointing to an enlargement of the prostate gland. The introduction of the cystoscope following the preliminary flushing and filling of the bladder encounters some difficulty in the posterior urethra, proving an obstacle in this region. The general inspection of the bladder shows pronounced trabeculation of the bladder wall indicating a labor hypertrophy of the muscular coat due to the necessity of overcoming an obstruction of the urinary canal. The normally concave contour of the internal urethral opening is changed to a V shaped figure in the upper circumference and to a convexity in the lower half, due to the bulging of the enlarged prostate into the viscera. The prostatic protrusion of the right side is covered by edematous mucosa that is spotted by dark patches, indicating submucous hemorrhages. On top of the prostatic lump there is to be seen a crater the edges of which are ragged, its center is covered by irregular discolored granulations, a few old coagula are attached to them and are floating with their free ends in the filling fluid.

Diagnosis Carcinoma of the prostate growing into the bladder and carrying on top a cancerous exulceration facing the interior of the bladder.

The therapeutic aspects of tumors of the bladder depend on the character of the neoplasm discovered. Papillomata of the kind demonstrated in the first case offer a favorable problem as to removal and remote results. Cutting operations in such instances are abandoned by all operators who are conversant with endovesical manipulations and they employ instead the destruction of these flimsy growths by the application of a spark produced by high frequency currents, the so-called fulguration. The reasons for this are weighty. Fulguration is executed through an operative or ureteral cystoscope, and therefore avoids opening of abdomen and bladder as preliminary for the removal of the growth, there is no necessity for having the

this quantity will be the limit of distention tolerated by the bladder for the purpose of inspection. The cystoscopic view presents in the vertex only normal appearing mucosa, the rest of the inner vesical surface is of a dark red hue without any visible blood vessels. The right lower quadrant of the bladder gives a distinct impression of rigidity, the right ureteral opening is gaping, its edges are sclerotic and remain immovable even during the act of throwing the urinary jet into the bladder, between the ureteral mouth and the internal urethral orifice there appears a loss of substance sunk down into the bladder wall, its margins are serrated partially undermined, its center is covered by irregular discolored granulations. This defect is surrounded by a few warty growths of an angry red dark blotches around them marking submucous hemorrhages. This picture characterizes an infiltrating carcinoma of the bladder wall without any distinct tumefaction protruding into the viscous. This infiltration explains the rigid resistance of the bladder offered to attempts at distention.

The last case to be presented concerns a man who reports symptoms that, as a rule, are ascribed to prostatic hypertrophy. He has been suffering for quite a long time from increased frequency of urination, his nightly rest is disturbed by repeated urinary calls, the act of micturition is not followed by the normal satisfaction, each movement of the bowels is accompanied and followed by disagreeable sensations in the rectum. He is permanently bothered by the feeling of carrying a foreign body in the lowest segment of the large bowel. Lately the region of the prostate became the seat of lancinating pains and he noticed repeatedly that the urine was stained with blood to a varying degree. Repeated catheterization and flushing of the bladder executed by his family physician failed to relieve his suffering and at certain instances the instrumentation was followed by rather severe hematuria. Rectal examination reveals the prostate to be considerably enlarged, embedded in the prostatic tumor there are to be felt several hard nodules that are extremely sensitive to touch, catheterization immediately following spontaneous urination proves the presence of a con-

being a urethral steel sound with a removable gold tip which functions as a filter. In prostatic tumors raying is also done from the rectum the container and filter placed in the lowest part of the rectum opposite to the prostate.

Fulguration in malignant vesical tumors is not only of very little therapeutic value but also liable to start an explosive luxuriation of the growth into the adjacent structures.

It remains to discuss the most efficient palliative intervention resorted to if the condition of the patient calls for immediate relief.

In case the patient should become highly uroseptic or if the bladder becomes so intolerant that the patient is in permanent agony or if the vesical hemorrhage becomes unmanageable the bladder has to be opened by suprapubic section. This drainage of the bladder will help to combat the urosepsis and at the same time makes the tumor accessible to topical treatment.

The most efficient way of dealing with the exposed growth is the coagulation of it by means of diathermy. This procedure consists in necrosing the tumor tissue by running through it high frequency currents of low voltage and high amperage. Through the resistance of the tissue to the current so much heat is produced in the structures that thorough coagulation is achieved.

For this purpose the tumor is caught between two rather larger electrodes and the current sent through it. By placing the electrodes opposite to each other at various diameters of the growth it is thoroughly coagulated. Transforming in this way the tumor into a leathery eschar immediately does away with the hemorrhage and pain while the sealing of the lymphatics and blood vessels in the neighborhood of the tumor prevents dissemination of tumor cells into the adjacent structures—a dangerous incident so often accompanying cutting operations for tumors. This cooking of the malignant growth is followed by systematic applications of a radio-active substance. In about ten days the eschar sloughs away and leaves a clean granulating surface. In a good many cases the operator will

patient laid up in bed and the natural functions of the urinary organs are in no way impaired. Fulguration in most instances may be performed without any anesthesia, in very sensitive individuals morphin or novocain anesthesia suffices.

Finally, the remote results of fulguration far excel the results furnished by cystotomy and excision of the papilloma. It is nothing unusual to see a cutting operation followed by multiple relapses all over the vesical mucosa, contrary to the experience in fulguration. The latter procedure may be repeated without any trouble any time that it is deemed necessary, and multiple tumors are just as easily handled by this method as single ones.

The operative therapy of malignant bladder tumors forms one of the tristest chapters of the, at best, rather unsatisfactory surgery of malignant tumors of the viscera. A great many cases coming under observation are already inoperable when they are diagnosed, operations even so-called radical ones, are almost invariably followed by early and extensive recurrences, not to mention that the primary mortality is very high. It therefore is not to be wondered at that a great many operators, and especially those with a large special experience, refrain nowadays entirely from operating for malignant tumors of the urinary bladder with a view of cure, and restrict themselves only to interferences of a minor character that tend to furnish some relief, such as cystostomy or nephrostomy—in the first instance to drain the bladder and to relieve it from painful distention by accumulation of urine, while, secondly the establishment of bilateral renal fistulas deviates the urine entirely from the bladder. This practice is supported by the fact that, especially in malignant tumors of the bladder, radiotherapy shows a favorable percentage of clinical cures and palliative achievements.

Radiotherapy does not produce any primary mortality, its administration does not lay the patient up and even if not successful it does not lead to the unspeakable suffering forced on the patient by recurrences after cutting operations.

The therapeutic rays are administered by placing the selected radio-active substance directly into the bladder, the carrier

CLINIC OF DR. WILLIAM EDWARD O'NEIL

EVANSTON HOSPITAL

PERSISTENT PATENT OMPHALOMESENTERIC DUCT

Summary Congenital anomalies of the umbilicus—their embryologic significance, symptomatology, technic of x-ray diagnosis of persistent patent omphalomesenteric duct, complete surgical removal, the only logical treatment.

History—The patient a healthy male child eight weeks old whose father and mother are living and well was born after a full term pregnancy and normal labor. At birth it was noted that the frenum of the tongue extended to the extreme tip of the tongue binding it firmly to the floor of the mouth so that motion was almost impossible. It was also noted that there was sufficient absence of prepuce to constitute a circumcision. A complete supernumerary little finger was present on the left hand. Nothing otherwise abnormal was observed until after the separation of the cord which occurred on the tenth day leaving a dark strawberry red velvety looking pedunculated rounded surface about the size of a cherry with a slight dimple in the center through which it was possible to pass a fine probe for a short distance (Fig. 167). Following the separation of the cord there was intermittent profuse bleeding from the remaining stump but this lasted only a few days and was succeeded by a slight capillary oozing which continued up to the time of operation. There was no discharge of mucus, urine, gas or feces from the umbilical region and there were neither signs nor symptoms of obstruction of the gastro intestinal tract. There was no evidence of hemorrhagic disease of the newborn or any evidence of syphilis. The child was breast fed and had gained in weight progressively and continuously and was free from distress except for occasional attacks of severe colic which seemed to

experience the satisfaction that the bladder closes up and that for a long time the patient is kept in apparently good health and free from suffering until complications or the formation of metastases in vital organs cause death.

The primary mortality of this procedure is not any greater than the mortality connected with a simple cystotomy in individuals of impaired health.

from the cloaca, while the upper tubular part is continued to the umbilicus and passes into the cord the remaining intra abdominal part eventually becoming the urachus. This upper part of the allantois normally obliterates before the termination of intra uterine life and is represented by a fibrous cord which is known as the urachus but it may persist as an embryonic remnant, open at both ends, producing urachal fistula, or closed at both ends with patent middle, producing urachal cysts. The early primitive gut tube was connected to the umbilical vesicle by the vitelline or omphalomesenteric duct which develops from the yolk sac by intrusion into the embryo. During the sixth week of intra uterine life the vitelline vesicle begins to lose its usefulness. The duct is attached to the ileum near the ileocecal valve, and at this time may do one of the following things (1) it may become obliterated, which normally occurs, (2) may remain a culdesac, (3) may remain patent connecting the interior of the ileum with the external world via the umbilical aperture which may give rise to congenital fecal fistula. The duct may also close at the intestinal and umbilical ends, remaining patent in the middle, producing an omphalomesenteric cyst. Another possibility is the formation of a fibrous cord extending from ileum to umbilicus, being attached to both.

Remnants of both the allantois and omphalomesenteric duct are found at almost all ages their recognition being due to the presence of urinary or fecal fistula or symptoms of obstruction of the gastro intestinal or urinary tracts, and their true nature often being diagnosed only at the time of operation or at autopsy.

Of the various abnormalities that may obtain in this region the following classification of the more frequent and important is taken from Cullen's excellent work on this subject.

A Remnants of omphalomesenteric duct

- 1 Umbilical polyps and granulomata
- 2 Gastric mucosa at the umbilicus
- 3 Patent outer portion of omphalomesenteric duct
- 4 Meckel's diverticulum
- 5 Intestinal cysts
- 6 Patent omphalomesenteric duct

bear no relation to feeding and which were not relieved by enemas but which did disappear after operation.

Comments and Operation.—Anatomic anomalies in the region of the umbilicus are not uncommon as may be seen from a perusal of Cullen's excellent work, *The Umbilicus and Its Diseases*, and though observed most frequently during infancy and early childhood they are also not infrequently seen in adult life when the symptoms of a mechanical or obstructive nature which they frequently cause demand investigation.



Fig. 16.—Cherry-like mass at umbilicus. Note dimple through which probe may be passed or by mouth so pens can be inserted into bowel.

To understand the cause and possibilities of the various abnormalities in the region of the umbilicus, in both the new born and the old we should briefly recall the following bit of embryology. The allantois, which is one of the earliest structures to be differentiated in the embryo, develops from the yolk-sac. It is recognized as a recess of the yolk-sac and extends into the body-stalk of the embryo. After a time the allantois is curved downward and forward and terminates in the cloaca at the lower end of the hind gut and a little later in embryonic life is separated from the cloaca by the urorectal septum. The bladder develops from the lower part of the allantois thus separated

there is found to be a patent duct at the umbilical end joined by a fibrous cord to the intestine while microscopic examination shows the mucous lining to resemble that of the intestine

Meckel's diverticulum is perhaps the most commonly found remnant of the vitelline duct and is the persistent intraperitoneal part of the duct, usually attached to the convex surface of the ileum a short distance from the ileocecal valve. It is free and ends blindly, though rarely may be attached to the mesenteric border of the intestine and may have a mesentery of its own. Meckel's diverticulum is a potential cause of intestinal obstruction, as the tip may become attached to a distant point or organ and thus form a constricting band. There is, in Cullen's review, a record of a unique case of strangulation of the bowel due to small intestine herniating through a hole in the mesentery of a diverticulum as shown at autopsy. Another very rare case, mentioned also by Cullen, shows the serious and fatal possibilities of Meckel's diverticulum in which intussusception of diverticulum took place into the intestine causing obstruction followed by gangrene perforation, and death. These cases are unusually difficult to diagnose, as there is no external local evidence that gives a suggestion of the cause of the obstructive symptoms. Laparotomy affording the only means of ascertaining the true nature of the obstruction.

Intestinal cysts form an interesting group of vitelline duct remains, and may be intraperitoneal, extraperitoneal, or intramural. They sometimes develop from Meckel's diverticulum by a process of slow rotation without strangulation or gangrene taking place, and they not infrequently arise from the central portion of a persisting vitelline duct by closure of the intestinal and umbilical ends. Those arising from Meckel's diverticulum may lie free in the peritoneal cavity, as they usually do, but may also be found between the layers of the mesentery, as Meckel's diverticulum may rarely be attached to the mesenteric border of intestine. These cysts lying free in the abdomen are in the same danger of rotation on their pedicles with subsequent strangulation and gangrene as are other cysts, such as ovarian or pedunculated tumors. A rare possibility is the formation

- 7 Patent omphalomesenteric duct opening at side of cord at birth.
- 8 Persistent vitelline vessels
- 9 Carcinoma

B Remnants of urachus

- 1 Patent or open with vesico-umbilical fistula
- 2 Closed, forming—
 - (a) Small urachal cysts
 - (b) Large urachal cysts which may be—
 - (1) Non infected
 - (2) Infected
- 3 Urachal cavities located between umbilicus and symphysis

Remnants of the vitelline duct usually partake of the histologic structure of the intestine

Umbilical polyps and granulomata are usually due to incomplete healing of stump left after separation of the cord. They may, however, be the external isolated end of the vitelline duct. They vary in size from that of a pea to that of a hazel nut or larger and may or may not be pedunculated. They are soft and red, and have often been observed to disappear after the local use of caustics or astringents.

The so-called gastric mucosa at the umbilicus is a polyp-like growth presenting an appearance not unlike the gastric mucosa and in isolated areas shows histologic elements similar to glandular structures in the pyloric end of the stomach. At times these growths present both the glandular structures identical with the glands of the pyloric end of the stomach and the glandular structure of the intestine. There are no recorded cases, however, of operation where a connection between these areas and the stomach was shown to exist.

When a patent outer portion of the omphalomesenteric duct is present there is usually found at the umbilicus a nodular or granulating surface with a depression and canal that permits the passing of a probe a variable distance into the abdominal cavity. In size these growth like projections vary from that of a pea to that of a chestnut or larger. When operated upon

Prolapse of bowel through a patent duct rotation of diverticulum and rotation of cysts with strangulation and gangrene and intestinal obstruction by bands and adhesions are among the more common causes that give rise to serious symptoms from the presence of these embryologic structures or remains. Among other sources of mechanical danger are the persistent omphalomesenteric vessels which may remain after obliteration of the duct or the remains of these vessels may be represented by fibrous cords which may easily cause constriction and strangulation of the intestines or omentum.

Remnants of the urachus usually partake of the histologic structure of the urinary bladder and are extraperitoneal. The open or patent remnants usually manifest themselves after the separation of the cord and the most common symptom is the discharge of urine at the umbilicus. The urine may come away in a continuous stream or slowly and intermittently which is by far the more frequent manner of appearing though if associated with obstruction of the urethra the flow is more or less constant excoriation of the surrounding skin ensues with the production of eczema from the irritating discharges which may also occur with a patent omphalomesenteric duct. The urachal canal may be straight or tortuous and varies in caliber. Closed remnants of the urachus usually manifest no external evidence early. The persistent urachus may be closed at the umbilical end and communicate with the bladder by the other end and in this instance go unobserved. Both ends of the urachus may be closed the middle portion remaining patent producing a urachal cyst. A urachal pouch may form from the closure of the bladder end of canal while the umbilical end remains open with intermittent discharge of contents.

The cysts resulting from a persistent urachus may be small which are often discovered only accidentally or may be large which because of their size or prominence require treatment and this is particularly true when the element of infection is added. Like remains of the vitelline duct these cystic formations are revealed very often only at the time of operation.

Diagnosis — The chief symptoms present in this patient are

of cysts within the abdominal wall. The size is not constant, and there are a few reported cases where such proportions were attained during intra uterine life as to make delivery impossible. Accurate diagnosis is possible only at time of operation, and oftentimes is not made except at postmortem examination. All cysts of this embryonic type usually give rise to symptoms early, but manifestations of their presence may be delayed until adult life, as is shown in one case where the patient (a woman) attained the age of thirty two before symptoms arose demanding operation, from which she recovered.

A patent omphalomesenteric duct also has a polyp-like external appearance, which is characterized by redness, a tendency to bleeding and capillary oozing and is often attended by the discharge of gas and feces at the umbilicus. Patients may attain adult life before the condition is recognized and symptoms arise calling for relief. The same dangers and difficulties may arise with this as with Meckel's diverticulum, such as the formation of a constricting band with the production of obstructive symptoms. By obliteration of the proximal and distal ends of the duct with the central portion remaining patent, cysts may form, being attached to the intestine and umbilical region by fibrous cords. Prolapse of the bowel may take place through the umbilical opening and the patency of the canal can often be easily demonstrated by the passage of a probe into the intestinal canal. A patent omphalomesenteric duct may open at the side of the cord and so manifest itself at birth, as is reported in several cases with autopsy findings and differs from the ordinary persistent patent vitelline duct in that the escape of intestinal contents takes place before the cord has separated. There is usually a tumor like projection at the side of the cord at birth, and within a few days there is a discharge of intestinal contents from this point.

Carcinoma of the umbilical region may be primary, as has been shown in many reported cases, but is almost entirely a condition of adult life, as all the reported cases were in late adult life, though two or three were reported as having been seen in young adults.

the only means of revealing the constricting bands or adhesions and associated pathology resulting from vitelline duct remains



Fig. 168.—x Ray plate after injection of bismuth suspension into sinus. Note bismuth shadows apart from the line of the sinus apparently the suspension passed into the intestine and is being disseminated through it

Following the diagnosis of these conditions the treatment is the most important consideration. Caustics and ligatures

hemorrhage from the stump remaining after separation of the cord and the strawberry redness of the small pedunculated mass. Absence of the discharge of contents of either bladder or intestine made a positive early diagnosis more difficult than if these valuable symptoms were present. However abnormalities in this region are most frequently due to the persistence in whole or part of embryologic structures, and it was assumed that either the urachus or vitelline duct was the cause of the condition present. Frequently a probe has been used as a means of diagnosis with varying degrees of success in revealing the patency and direction of fistulae when they are present. There are some few instances in which a probe passed through the urachus from the umbilical opening has produced a metallic click and could be felt with a metallic catheter passed into the bladder per urethram. The absence of local symptoms other than slight hemorrhage and a mass at the umbilicus adds greatly to the difficulties of differential diagnosis before operation.

The success of bismuth and x-ray as a diagnostic measure in disease of the gastro-intestinal tract suggested a new and efficient means of establishing and confirming diagnosis before operation and was resorted to in this case with gratifying results. A sterile solution of bismuth subcarbonate was injected under slight pressure into the central depression of the umbilical stump and an x-ray was immediately taken with the result shown in the accompanying skiagram (Fig. 168). The bismuth can be seen in the fistulous tract apparently communicating with the bowel. Fifteen minutes later an x-ray was again taken and the bismuth was seen disseminated through the bowel having left the fistulous tract extending from the umbilicus to the intestine. Eighteen hours later chemical examination revealed the presence of bismuth in the stools establishing the certainty of this being a persistent patent omphalomesenteric duct.

Frequently the first evidence of possible embryonic remains in the umbilical region is ushered in by symptoms of obstruction or strangulation of intestine or strangulation of omentum without any external focal signs and operation or postmortem affords

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CLINIC OF DR B F LOUNSBURY

WASHINGTON BOULEVARD HOSPITAL

PLASTIC REPAIR OF THE HEEL

Summary Demonstration of 3 cases in which large cutaneous defects over the os calcis have been repaired by the Italian method of skin transplantation discussion of technic

DURING the past five years I have had occasion to care for 3 unusual cases of injury involving the heel. The damage sustained was of such a character as to wholly incapacitate the man from physical labor yet was not severe enough to warrant an amputation of the foot.

The problems to me were unique and it is because of the unusual features of the cases that I thought them of interest enough to present to you. A brief history of the cases with the methods employed are as follows:

Our first case received an injury in 1913, which crushed the lateral side of the foot, destroying the distal end of the fifth metatarsal and little toe, and tearing away the entire pad of the heel and crushing the posterior tip of the os calcis. The ankle-joint and other structures of the foot were intact and the doctors in charge hoped to save a useful foot. At various times skin grafts were applied until all the raw surfaces were covered. It was found, however, that an area over the end of the os calcis persistently broke down and remained as an open ulcer. The foot was in this condition in June 1914, when he came under our care.

I had never before transplanted a flap over the end of the heel, but after placing the foot in various positions, decided that a flap could be elevated from the back of the thigh. This was done and the heel was held in a cast against the back of the

have been used extensively with the hope of effecting a cure the instances of good results however being exceptional. Abdominal operation offers the only safe and certain way of dealing with these establishing certainty of diagnosis and removing the possibilities of future complication. The use of the cautery has in a few instances been followed by permanently good results but in the light of more recent and extensive experience this means of treatment will give way to early and complete operation. Operation is relatively simple and not fraught with danger except when resorted to to relieve obstructive symptoms after gangrene and infection are already present.

Operation.—An oval incision encircling the umbilicus and tumor was made extending in an upward and downward direction as shown in illustration (Fig. 169). After entering the peritoneal cavity and locating the duct at point of attachment to the bowel which was on the convex surface of the ileum about 1 foot from the ileocecal valve it was clamped and ligated as one does the appendix in the ordinary appendectomy surrounded by purse string suture and the tumor cauterized and incinerated. This was followed by a longitudinal top-stitch and the abdomen closed in the usual way (Figs. 169 and 170).

If not operated these conditions may persist for years without giving rise to serious complications, as is evidenced by one patient attaining the age of twenty-eight years before sufficiently distressed to seek relief. Early and serious complications are to be expected and as soon as even a probable diagnosis has been established operation should be urged in the absence of good contraindication.

The child made an uneventful recovery with prompt relief from the severe attacks of colic preceding operation and is now living and well.



Fig. 172—Case I. Medial aspect of site of plastic heel five years after operation.



Fig. 173—Case I. Lateral aspect of site of plastic heel five years after operation.

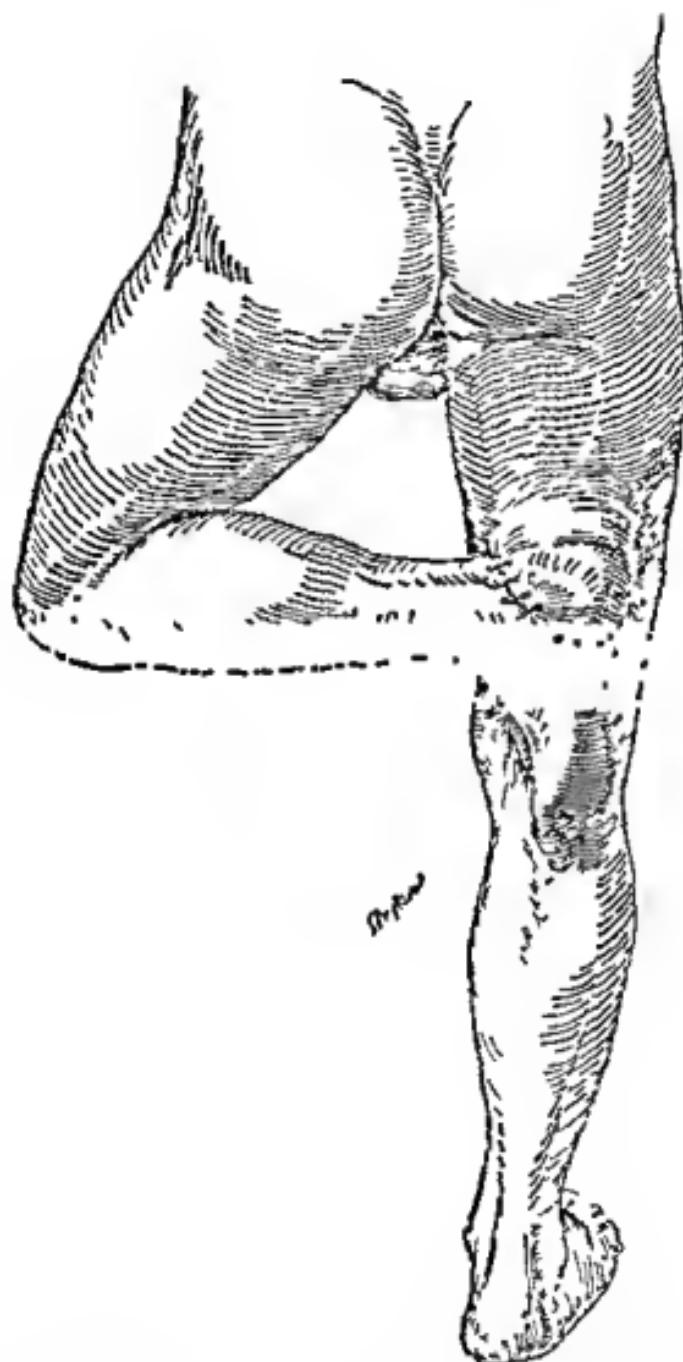


Fig. 171.—Case I. Diagram showing flap of skin from back of thigh in process of transplantation to cover cutaneous defect on the heel of the opposite foot.

the demands of the pressure placed upon it and he now has a very excellent weight bearing surface in this transplanted tissue

It was necessary to place the patient on his face with his leg crossed behind him and hold him in a cast. The discomfiture from this was extreme and I thought at the time that if occasion ever again arose for a similar operation I should try to avoid keeping him on his face as the position was difficult for the patient and made it difficult to care for him.



Fig. 175.—Case I. Scar on back of thigh five years after operation. It is supple and does not interfere with function.

In January 1916 we received another patient who had the right leg crushed off below the knee and crushed off his left heel. The os calcis was cut through about midway between the anterior and posterior ends. The entire padding and soft tissues about the heel were destroyed. The question arose at that time of amputating the foot but the doctors in charge decided to try to save it. He came under our care some time later with an ulcer on the heel which could not be covered with skin because

thugh for fourteen days when union was firm enough to cut away the flap. Ultimately an excellent covering was developed for the heel (Figs. 171-176). When the patient was first permitted to step on the foot he was provided with an arch support



Fig. 14.—Case I. Plantar aspect of site of plant graft 5 years after operation.

which helped to take some of the pressure from the heel. In September 1913 he was again able to resume his work and has never been obliged to lay off a day since that time on account of any trouble with his heel.

Gradually, the transplanted skin has toughened up to meet

the demands of the pressure placed upon it, and he now has a very excellent weight bearing surface in this transplanted tissue

It was necessary to place the patient on his face with his leg crossed behind him and hold him in a cast. The discomfort from this was extreme, and *I thought at the time that if occasion ever again arose for a similar operation I should try to avoid keeping him on his face as the position was difficult for the patient and made it difficult to care for him.*



Fig. 165.—Case 1. Scar on back of thigh five years after operation. It is supple and does not interfere with function.

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Fig. 166.—Case I. x Ray of heel two years after operation. Note the increased density of the bone at the posterior end of the os calcis persisting as a result of chronic infection incident to the exposure following the initial trauma.



Fig. 167.—Case II. Medial aspect of heel before operation. Note ulcerated areas where previous Thiersch grafts have broken down.

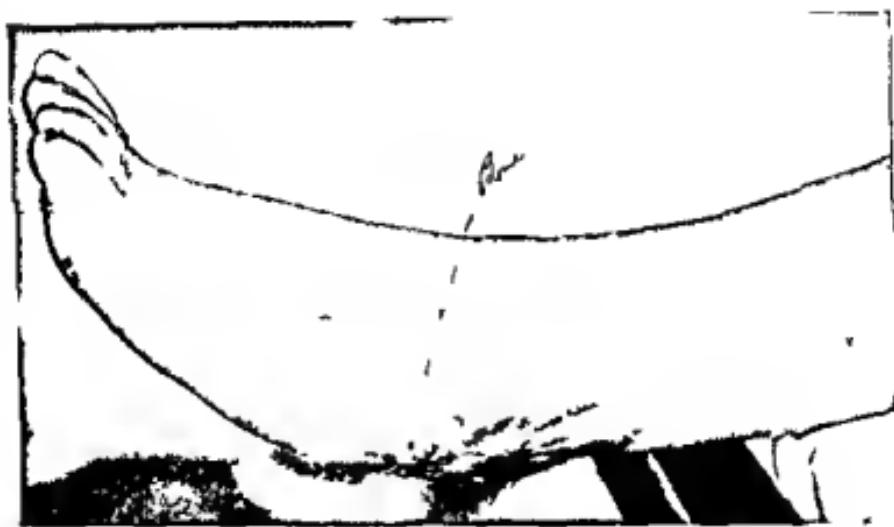


Fig. 178—Case II. Lateral aspect of heel before operation. Note ulcerated areas where previous Thiersch grafts have broken down.



Fig. 179—Case II. Posterior aspect of heel before operation. Note ulcerated areas where previous Thiersch grafts have broken down.



Fig. 180—Case II. X-Ray of foot before operation. Note bony exophytosis corresponding to areas of ulceration shown in preceding photographs.



Fig. 181—Case II. First stage of operation completed. Affected foot immobilized on anterior aspect of opposite thigh by plaster cast. Skin flap remains in position without tension.



Fig. 182.—Case II. First stage of operation completed. Affected foot immobilized on anterior aspect of opposite thigh by plaster cast. Skin flap remains in position without tension.



Fig. 183.—Case II. Sixteen days after primary operation. Stitches have been removed and flap is about to be freed from the thigh.



Fig. 184.—Case II. Neuring completion of second stage flap has been freed from thigh and brought around heel by long tension sutures; coaptation sutches not yet in place.



Fig. 185.—Result in Case II eight months after operation.



Fig 186.—Result in Case II eight months after operation



Fig 187.—Case II. Deep scar on anterior surface of thigh eight months after operation. As this patient had lost the leg below the knee on this limb the scar shown here produced no inconvenience.



FIG. 144.—Case III. x Ray of foot before operation. Note change in os calcis similar but more marked than those in Case I.

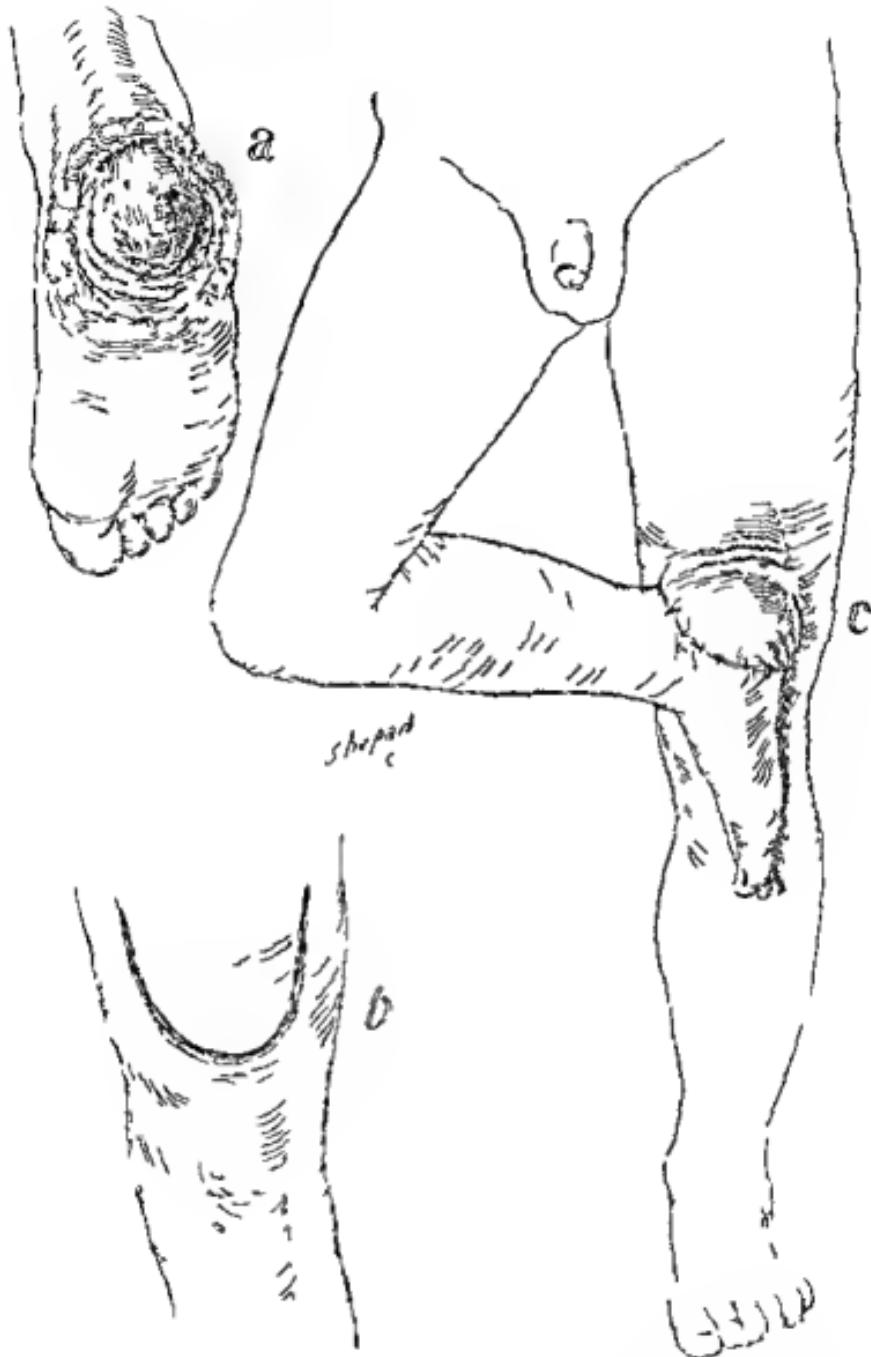


Fig. 187.—Case III. Details of operation. *a* Defect in heel at beginning of operation. *b* V-shaped incision on anterior aspect of tibia of opposite leg which outlines flap to be transplanted. *c* First stage of operation completed ready for application of cast.



Fig. 18^a—Case III. x Ray of foot before operation. Note changes in os calcis similar to but more marked than those in Case I.



Fig. 191.—Case III. Condition about three months after completion of second stage of operation: flap healed securely in place



Fig. 192.—Case III. Condition about three months after completion of second stage of operation: flap healed securely in place

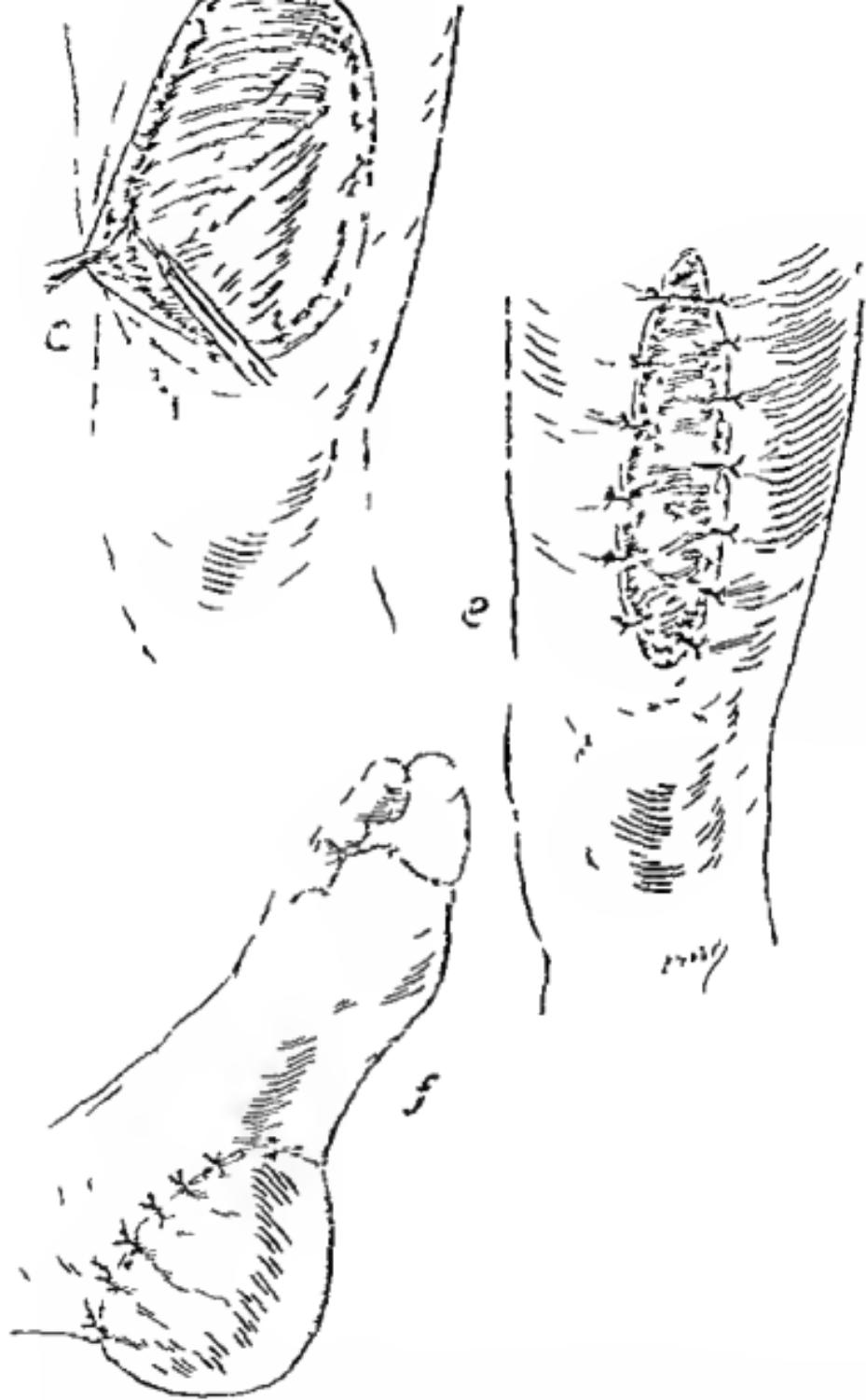


Fig. 190—Case III. *d* and *e* End of second stage of operation. pedicle of flap has been cut, the edges of the defect on the thigh are undercut, the skin mobilized and the defect closed as nearly as possible. any uncovered area may be closed by Thiersch grafts. *f* flap freed and in place on the heel

About six months after this operation a case was brought to my clinic in Cook County Hospital for a curement of the os calcis because of a persistent ulcer on the heel. Inquiry into the history showed that the patient had two years previously had the



Fig. 194 Case III. Scar on anterior surface of thigh three months after operation has almost healed and though there is still considerable interference with the usefulness of the underlying muscles function rapidly returning to the

end of his heel crushed off in an accident in Mexico and though skin grafts had been applied an area of about 1 inch in diameter remained as an open ulcer. A radiograph showed that the periosteum over the end of the os calcis had been damaged and had produced a thickening in this region.

of the dense scar tissue. Two and a half years after his injury he was still unable to use his foot, and was walking with an artificial leg and a pair of crutches. In July, 1918 we performed a flap operation to cover the heel. Hoping to obviate some of the difficulties encountered in the first operation, we sat the patient up and crossed his legs in front of the thigh holding it in a cast.



Fig. 193—Case III. Condition about three months after completion of second stage of operation flap healed securely in place.

This was a great improvement so far as the position of the patient was concerned but we found later that the pressure of the external malleolus over the front of the thigh was so great that it produced necrosis that reached to the femur and necrosed the skin over the external malleolus. It was necessary to take a large amount of flap away in order to cover this defect over the malleolus. Subsequently we skin grafted the area over the front of the thigh and there has been a full restoration of the function of the quadriceps muscles and tendons (Figs. 177, 187).

CLINIC OF DR. WILLIAM F. HEWITT

PRESBYTERIAN HOSPITAL

INDICATIONS FOR CESAREAN SECTION

Summary Three cases illustrating factors to be considered in deciding for or against cesarean section in the treatment of the complications of pregnancy and labor

INASMUCH as the hardest problem in the cesarean section operation is knowing when to do it and when not to do it, I shall present 3 cases which, in view of the widely differing indications for operation proposed in different clinics may be of interest to others as they were to me

CASE I—CESAREAN SECTION AND PLACENTA PRÆVIA

The first patient was brought to my service at the Presbyterian Hospital in a condition of shock following a hemorrhage extending over about a week, and giving a history of repeated hemorrhages for several months previous to this. Upon vaginal examination a placenta prævia centralis was found and upon abdominal examination an approximately seven month fetus was palpated. A brief summary of the history follows:

Mrs. S. K. Present complaint Escape of blood from the vagina, pregnancy

Hemorrhages began about the middle of last October, about three months ago, continued two days, two napkins each day. Since that time about every three weeks has had a little bleeding. Patient states it was about 1 tablespoonful each time, 2 A.M. Tuesday morning began to bleed freely, continued for about two hours. Used five napkins, which were soaked. At this time had severe chill, and when she went to the toilet bleeding started. Wednesday morning at 12:30 hemorrhage started again, continued for two hours, used six napkins. Complained of pain over pubis.

We decided that the only way to get a serviceable foot was to put a transplant over the denuded area. With our experience of the two previous cases we hoped to make this patient the most comfortable and avoid the sloughing which took place in the second. We turned up the flap from the front of the thigh but padded well to keep pressure off the external malleolus. We found when ready to cut the flap down that in spite of all our precaution necrosis had taken place as in the second case. Despite this we have secured a degree of healing which now seems certain to give a good functional result (Fig. 188, 194).

small when retracted, edges approximated much easier than normally. Tubes crushed and tied with catgut, but not divided on account of religious scruples.

Child good size for six and a half months. Looked more like a seven and a half months' child. Made a few gasps and heart beat feebly for a while. Peritoneum was very friable and tore very easily while closing. Owing to the exsanguinated condition of the patient it was impossible to risk any anesthesia whatsoever and the straining prevented a good peritoneal closure. Anterior fascial closure was therefore made more secure than usual. Two gauze drains in wound, one at either end of incision.

Patient was then put in lithotomy position and the previously inserted vaginal and cervical pack removed. The uterine pack inserted from above was located and removed also. The uterus was then packed with silver nitrate gauze.

Postoperative Course—A "normal" glucose solution (5 per cent), 6 ounces, with 20 grains of sodium bicarbonate, was given per rectum until fluids were freely taken per mouth. This procedure is followed in all my operative cases, and there has been much less postoperative vomiting and acidosis since this has been done.

The results of the operation appear to justify its performance. I feel that there would have been almost certain death if we had done a version on account of the extreme difficulty of separating this densely adhering placenta; the postpartum hemorrhage would have been severe. The woman was sterilized, as she had a history of pulmonary tuberculosis. She has made an uneventful recovery.

CASE II—ECLAMPSIA AND CESAREAN SECTION

This case is mainly of interest in view of the convulsions occurring in a case of pre-eclamptic toxemia undergoing treatment in the hospital with the blood pressure falling. I saw this patient at about the eighth month and obtained the following history:

Pregnancy—Date of last menstruation was June 1, 1918
Will be full term March 7, 1919

Family—Has had 11 children 6 of whom are living. Those dead died of bronchitis, accident, "summer complaint," and 1 lived only two hours, 1 died of pneumonia at one and a half years. Has had 5 miscarriages. One miscarriage between each of the births.

Menstrual—Menstruates regularly every twenty-eight days, has much pain the first day of each period. Menstruated first at sixteen years.

General—Appetite fair, bowels constipated burning on urination—noted for last few weeks. Has been in sanitarium on account of pulmonary tuberculosis.

Remarks on First Stage—Bleeding per vagina, cervix effaced os two fingers' dilatation but covered over by mass resembling placenta. Manipulation of this tissue caused free bleeding so that she was packed with two pieces of surgical gauze—one knot. No pains noted during examination.

In this case one hesitated in doing a cesarean section as there was so little prospect for a living child. However, as the woman was in bad condition and the os was only two fingers in diameter, I felt that cesarean offered the best prognosis for the mother. As tampon treatment followed by a version would probably have been a bloody procedure during the dilatation stage, and in boring through the placenta in order to do the version one would face the almost certain prospect of severe hemorrhage, I felt that there would be little hope for the mother also that early version meant a high percentage mortality for the child. An immediate cesarean section, abdominal route, was therefore done under local anesthesia. The following operative notes were made.

Omentum adherent along the line of an old midline lapa rotomy scar. Uterus soft. Pituitrin (4 c.c.) injected into the anterior wall of uterus and uterus incised. Placenta very tightly adherent, centrally placed over the internal os. Removed in pieces with great difficulty. More hemorrhage than usual during removal. Uterus packed from above. Uterus very

and up to 9 P. M., when she recognized her surroundings. The pulse varied between 140 to 160. One hypo (1 c.c.) veratrone seemed to slow the pulse, and the patient did not have a convolution following its injection.

This case, then, has interesting features from the standpoint of treatment, as there are two distinct methods of treating eclampsia. The older one, which consists in emptying the uterus immediately, and the Strelanoff or expectant method, in which the patient receives treatment as for nephritis, with the addition of depressant drugs such as the bromids, chloral, and even morphin. No operation is done save easy ones in labor. Interruption of pregnancy is not usually performed. I have seen excellent results follow this latter method during my assistantship at the Glasgow Royal Maternity Hospital where there is an abundant number of eclamptics. From my experience I do not feel that traumatic shock producing or acidosis producing operations are anything but hazardous for an eclamptic. However, in this case we have not "many more shots in our locker," as the case has been under treatment for four days. Statistics and my experience agree that if the labor or pregnancy is terminated by cesarean section, the most opportune time is at the *onset* of the convulsions. Therefore I did an abdominal cesarean section under local anesthesia on a comatose patient, and delivered a live child which weighed 4 pounds, 10 ounces. Before operation what were believed to be the fetal heart tones were heard in the L. L. Q. at the rate of 140. Section was done under local anesthesia entirely. The infant gasped shortly after delivery, but there was considerable meconium and mucus in its throat. It was never very blue and became red quite rapidly.

The patient made an uninterrupted recovery, has had no further convulsions and her systolic blood pressure is now 130. The baby is beyond the birth weight at ten days and is now apparently healthy.

Vaginal cesarean at the eighth month is more traumatic to both mother and child than the abdominal cesarean, and the latter is, therefore, the operation of choice at this period.

Mrs E L, aged thirty. *Present complaint:* Swollen feet and hands and headaches. Duration—two weeks ago first swelling appeared. Could not button shoes. Hands swollen to slight degree. Could not get rings off easily. Headaches—has always had them to some degree, have been no worse during this pregnancy than before.

Menstrual:—Began at seventeen years, every four weeks, duration six to seven days, two napkins. Always some pain. Not so painful after first baby was born. Pain during whole of period.

Marital:—Married at twenty years. First child now eight years old. No difficulty at labor, which lasted six and a half hours. Nursed baby nineteen months. Periods at eleven months after. Slight tear—unrepaired. No kidney trouble, no miscarriages, no fever. Some bleeding in November 1917, at the sixth to eighth week, no bleeding afterward. Has had no leukorrhea until about a week ago, does not soil clothing. No backache. The urine contains albumin and a few hyaline and granular casts.

She went over to the hospital on the day on which I first saw her, and was put under a routine treatment consisting of sweats each day and sodium bicarbonate in sufficient amounts to alkalinize the urine, also low protein intake and hydragogue cathartics. The systolic blood pressure, which has been about 170 dropped to 120 in four days but the albumin did not decrease, although the hyaline and granular casts disappeared. When I saw the patient at noon on January 29th she wanted to go home, as she felt so well. I persuaded her that she should stay. About 5 o'clock a headache developed. In the nurse's record I find the following statement:

This P.M. patient complains of severe headache which was not relieved by aspirin and pyramidon. At 7.30 P.M. there was a convulsion lasting one or two minutes in which there were clonic spasms, with retraction of the head, extreme flexion of the hands, "cracking" of the muscles of the shoulder, and nystagmus. This was repeated three times in the following forty-five minutes. The patient was in coma during this time.

urination Pains became irregular Brought to hospital in police ambulance at 4 A M (2/6/19)

5 A M Examined by intern Prominence resembling a full bladder on pubis Catheterized 100 c c urine obtained could not eradicate tumor Prominence still dull on percussion

Abdominally—left position—shoulder in midline

Heart tones good—128

Rectally—head has a good sized caput Cannot be disengaged

No cervix felt vaginally Head $2\frac{1}{2}$ phalanges from outlet—considerable caput Os completely dilated Parietal bones overlapped—sagittal suture near promontory

Conjugata—Diagonalis 10 5 cm (approximately)

Sacrum bent sharply just below promontory—deflexion is slight—in all probability less than previously Occiput is 1 inch nearer than sinciput

8 A M Examined rectally by Dr Hewitt 50 c c bloody urine by catheter

Uterus tight about child distinct furrow at about the level of the navel transversely Tumor below navel

This case is interesting from the fact that the patient had already had several successful labors the first only being instrumental and resulting in a dead child This patient was in labor a total of twenty eight hours so far as her history shows The head was in anterior parietal bone presentation which often occurs in a rachitic flat pelvis The caput was so marked that the senior intern called up on admitting the case to the Presbyterian Hospital that the head was $2\frac{1}{2}$ phalanges away and that the case would easily deliver There was a well marked suprapubic tumor which he thought was a bladder Catheterization however did not reduce the size of the suprapubic tumor but the intern felt this might be due to pressure of the head upon the catheter The junior intern who had been watching the case in the home very closely said that this suprapubic tumor only arose when the patient was nearing the hospital in the ambulance and the patient voided only shortly before leaving for the hospital When I palpated the abdomen there was con

CASE III.—DYSTOCIA, THREATENED RUPTURE OF THE UTERUS,
AND CESAREAN SECTION

History of previous child bearing and present confinement

Four years ago First child (boy), delivered by forceps operation after an eighteen hour labor, child dead Doctor in home—was there twenty four hours before operation

Three years ago Boy—born after fairly short labor, living and well

Twenty months ago Boy—twenty hour labor, living and well said to have weighed $7\frac{1}{2}$ pounds

This labor False pains ten days ago Labor began 2/5/19 about 3 A.M., but such pains as disturbed the sleep only At 6 A.M. definite regularity of pains

8 A.M. Spot of blood and some slime Pains of twenty minutes

9 A.M. 3 grains of quinin given by students (of own accord)

10.30 A.M. Seen by intern—vaginal examination. Cervix not effaced dilatation three fingers Head not engaged Given 30 grains of chloral hydrate per rectum Said to have been expelled Pains five to ten minutes

3 P.M. Pains of three minutes Seen by intern. Examined rectally Dilatation size of dollar, not effaced, head just reached by finger, not firmly engaged Given 20 grains of chloral hydrate by mouth at 4.30 P.M. Pains more intense, but patient slept about three-quarters to one hour

6 P.M. Membranes ruptured spontaneously

10.30 P.M. Vaginal examination by intern O₂ nearly dilated admitting whole hand, sagittal suture near promontory nearly transverse Anterior fontanel posterior to right head military, face to right parietal bone (right) presenting

11.15 P.M. Given $\frac{1}{2}$ grain of morphin

2 A.M. (2/6/19) Given $\frac{1}{2}$ grain of morphin sulphate before ambulance ride

Heart tones Heart beat to the left of midline in lower quadrant, 130

Patient Went to stool often and said with success as to

point 6 inches above the pubis. Thus the skin incision was performed carried high above the navel to admit of delivery without bladder injury. Tetanus uteri was better demonstrated on actual palpation. The fundal musculature was all in a bunch. Approximately $3\frac{1}{2}$ inches of the thin lower uterine segment was palpable above the plica vesico uterina, on incision the fundal musculature was found to be about $2\frac{1}{2}$ inches thick, while the lower uterine segment was not over $\frac{1}{2}$ inch thick.

Delivery of the child was accomplished without difficulty in dislodging the head.

The recti were dissected out with some difficulty, but finally brought together in a satisfactory manner.

The thin fascia above the umbilicus gave some difficulty in closure, but the thoroughness of the previous local infiltration together with the remarkable co-operation of the patient combined in allowing a quite satisfactory peritoneal closure.

The tubes were divided and burned at the express request of the patient that she be allowed to have no more children.

The child was born covered with meconium and with meconium and mucus in its pharynx, artificial respiration was necessary. Its head was greatly misshapen bulging to the right. The right parietal bone was the bulging part. There was a distinct pressure furrow at the base of the bulge. To the left, about the middle of this parietal bulging, was a dry place about 1 inch in diameter, dark red with $\frac{1}{4}$ inch light red border, resembling a pressure spot from resting on the promontorium sacri. There was no "whining" by the child after delivery.

No pituitrin was injected into the body of the uterus, as the uterus was in tetanic contraction. As the patient's pulse, at first 90, had risen to 140 and respiration had increased even before operation, I felt that a hysterectomy should not be done.

siderable difficulty in distinguishing whether all the suprapubic tumor was Bandl's ring and a dilated lower uterine segment, or partly Bandl's ring and partly distended bladder, as the subcutaneous fat was so plentiful. By rectal examination the head seemed fixed, but upon easy pushing of the head it was apparent that it could be displaced. There was a diagnosis then made of threatened rupture of the uterus with an anterior parietal bone presentation in a patient who had had three vaginal deliveries, and in whom the membranes had been ruptured for twenty-four hours. There were three possibilities to consider—forceps, version and cesarean section. Version was contra indicated, as we had a threatened rupture of the uterus. Forceps were not used, as the greatest diameter of the head had not entered the inlet, and although the head was only $2\frac{1}{2}$ phalanges away, forceps would only have been successful if they had been sufficiently crushing to permit dragging the too large head through a too small inlet. Such a procedure promised cranial damage and maternal laceration. Cesarean section was therefore done under local anesthesia. By this time Bandl's ring was two fingers above the umbilicus. I present the operative history.

Abdominal cesarean section at 9 A.M. Fetal heart rate 156 to 160, maternal heart rate 140. The indications for operation were a flat pelvis, obstructed labor, and threatened rupture of the uterus.

Condition of Patient—There was a deep crease in the pregnant abdominal tumor. This was at first considered to be a full bladder. However, two attempts at catheterization failed to eradicate the suprapubic prominence. The crease lay 7 inches above the pubis. The fundus uterus above the crease was in a state of continuous contraction. No relaxation could be detected on long palpation.

Operation—Cautious thorough unhurried local infiltration

CLINIC OF DR V D LESPINASSE

NORTHWESTERN UNIVERSITY MEDICAL SCHOOL

STERILITY¹

Summary Methods of determining the cause of sterility in male and female
technic of uterine insemination treatment of sterility in both sexes

I WISH first to express my appreciation of the honor of receiving this invitation to address the Medical Officers of the Great Lakes Naval Training Station, and shall aim to give you some new ideas, to show you what we have accomplished in our endeavors to relieve the distressing condition of childlessness. Folklore has taught that sterility was always due to the woman and medical men until very recently have accepted this legend and used it as a basis for treating only the woman. As a matter of fact, about half the cases are due to faults in the woman and half to faults in the man. When a couple present themselves for examination there are three major things to be ascertained. First is the fault in the woman, second is the fault in the man, third is the fault in this particular combination.

In the examination of the woman the first thing to investigate is the condition of the ovary. First, let me say that the anatomic and physiologic conditions in a woman are such that any opinion as to her fertility or sterility is subject to much more uncertainty than a similar opinion in regard to the man. You examine a man and when you are through you can say This man cannot have a child. You cannot be so positive after examining a woman because the anatomy and physiology of the female genitalia are so different from man. What can we tell about the condition of a woman's ovary as regards reproduction? In some ways we can tell a great deal, in others we can only arrive at an opinion by exclusion. The ovary is a dual functioning

¹ Clinic given before the Medical Officers of the Great Lakes Naval Training Station February 27 1919

Obstruction in the fallopian tube is a common cause of sterility in women. If you have a history of a pelvic peritonitis you may have an obstruction in the tube due either to a closure of the fimbriated end of the tube or the tube may be constricted by a band of adhesions. These women menstruate normally and there is nothing about their secondary sex characteristics that is unusual or abnormal. The lesion in this instance may be detected by bimanual examination but the chief point is the history of previous pelvic infection of some type. The absolute diagnosis is made by exclusion and confirmed by laparotomy.

The purpose of the uterus is to prepare a nest for the impregnated ovum when the unimpregnated ovum comes into the uterus. The ovum elaborates an enzyme that absorbs the endometrium at the point of contact. If this enzyme is not produced or is prevented from functioning you will have impregnation but no pregnancy. The ovum will continue on down and be lost. This condition clinically is called defective implantation and is closely allied to a condition known as irritable uterus where the ovum implants and develops for a week or two and then aborts. I know of a woman who has had sixteen pregnancies in nine years of married life and as yet has never had a baby. She conceives very readily but she has what the obstetricians call an irritable uterus. What that means I do not know whether it is some defect in the enzyme production or whether it is an endometritis or the lack of some hormone due to premature destruction of the corpus luteum I do not know. You know when a veterinarian performs an abortion on a cow he does not touch the ovum or enter the uterus the veterinarian simply puts his hand into the rectum and squeezes out the corpus luteum from the ovary and the very next day the cow aborts. Perhaps something destroys or inhibits the growth of the corpus luteum in defects of implantation.

Clinically we recognize an implantation case by the following data. In the history the point is usually brought out that the woman frequently goes over a few days or a week and then there is a slightly larger flow than is normal. This fact together with

organ producing the ovum and also an internal secretion. Many women who are sterile from congenital ovarian disease have many of the secondary sex characteristics of a man. They are inclined to have a beard. Their pelvis tend to be of the masculine type. Their voice is a trifle heavy. Their breasts are small and their menstrual function is not normal usually being scanty and the interval prolonged.

The ovary may produce a perfect internal secretion, but be deficient as regards the production of ova. This is the type of case due to a congenital ovarian defect of both elements of the ovary. This condition can be absolutely proved by laparotomy when one will find the ovary small and hard and with very few Graafian follicles in it. The commoner condition is in my opinion deficiency in the production of ova while the internal secretion is produced and utilized by the individual. This type of woman will be perfectly normal as regards her menstruation her sexual desires and her feminine secondary sex characteristics are normally developed but she does not conceive when everything is apparently favorable to conception. What produces this clinical condition? Is it a congenital deficiency in the production of ova or are there adhesions around the ovary or is the fimbriated end of the fallopian tube closed by adhesions? At least something is wrong either in the production of the ova or in their transportation. Can this deficiency of ovulation be due to some disease that interferes with the ovary? Adhesions around the ovary that strangulate the blood-supply will produce a condition in the ovary known as multiple cysts. An analogous condition can be produced in the ovary of a guinea pig by starving the pig for five or six days giving it just enough food to keep it alive. Then feed it up and at operation you will find the same condition in the ovary that you see so frequently in gynecologic cases the ovary just studded with small cysts. If a woman goes through a long period of severe physical strain or debilitating illness this cystic condition may develop in the ovary. The diagnosis of these ovarian conditions can be strongly suspected from the history and made by exclusion after a long and exhaustive study of the particular case.

fact that in its essence coitus is a purely mechanical process. It does not make any difference whether the spermatozoa arrives at the uterine fundus by its own power or whether it is thrown there through a rubber tube, but some women will not permit an intra uterine injection of spermatozoa, as according to their ideas the baby would be marked or something terrible would be wrong with it. This is an erroneous idea, as all the uterine insemination babies that I have seen have been perfectly normal.

The next step in the examination of a childless couple is what we call 'the combination.' You have examined the man and he has normal spermatozoa. You have examined the woman, and as far as can be told she is normal. Now one must determine the reaction between the spermatozoa of the particular man and the cervical and vaginal secretions of the particular woman. This method of examination was developed by Dr Max Huhner and is known as the "coitus test." It is simple enough. The couple has intercourse in a normal manner in the morning, and then the wife comes to the office three or four or any time up to eight hours after—best about three or four hours. She is placed on the table in the Sims position, the vagina opened, the cervix exposed and whatever material is adherent to the cervix is taken on a wire and an examination made for spermatozoa. Material is also taken from inside the cervical canal and from the vagina. At the end of an hour there should be a good deal of semen in the vagina. The only spermatozoa that are alive in the vagina after one and a half hours, as a rule, are those that have been protected from direct contact with the vaginal secretions by the clotting mechanism of the semen itself. The cervical canal should be teeming with spermatozoa from one to three hours after coitus. They remain in the cervix alive and motile up to five or six hours, so that at the end of four or five hours you should find the cervical mucus alive with spermatozoa that cross the field in ten seconds. If one finds the spermatozoa all dead then one knows that there is something in the woman's vaginal secretion or cervical secretion, whichever it is, that is destroying the motility of the sperma-

negative data as to cervix, secretion, uterine position and normal spermatozoa, should make one strongly suspect an implantation defect.

To diagnose ovarian and tubal causes of childlessness requires several chances and the intelligent co-operation of the patient. First, we must have normal spermatozoa. Second, the spermatozoa must be obtained active from the cervical canal three or four hours after coitus. Sometimes you can obtain the spermatozoa from the uterine fundus if you care to do it but this manipulation requires a special technic and is not adaptable as a routine procedure. You should have made four or five injections of spermatozoa into the uterus at appropriate times. If after all these conditions have been fulfilled the woman does not conceive, you know the trouble is in the tube or ovary, and to make a differential diagnosis between these two locations you must do a laparotomy. Laparotomy for sterility in woman should not be performed until all these examinations and manipulations have been performed as preliminary diagnostic tests. After you have studied the patient as outlined above you can perform a laparotomy, and when the abdomen is opened one knows just where and what to look for.

The cervix conditions that cause childlessness are well understood. The pinpoint os and small defects in the cervical canal have been described frequently as to their etiologic relation to sterility. It is difficult to say how small a cervical opening will prevent the entrance of spermatozoa. Dilatation of the cervix in my opinion is not certain of results as the dilatation frequently does not persist. Why not put 3 or 4 drops of semen into the uterus with a catheter and let the baby dilate the cervix thoroughly for the second child? Plastics on the cervix like Pozzi's operation, are unnecessary if you will use uterine insemination because insemination will do all that any cervix plastic will do to relieve sterility.

Just a word in regard to uterine insemination. The general public does not look at insemination in the frank mechanical way that the physician does. Sexual intercourse is such a complex act as regards the psychic side that the laity overlook the

there that that man is sterile. You do not need to examine the woman until his condition is corrected.

The next question confronting one is: Is this a production or a transportation case? We first examine the testicles and see if they are normal in size, consistency, and sensitiveness. The testicle that is producing spermatozoa is elliptic, relatively soft, and is quite sensitive. The testicle that is not producing sperm has a tendency to be hard, globular, smaller and less sensitive. Then your secondary sex characteristics, are they well developed? Has this man all the secondary sex characteristics he should have? Has he a very scanty beard, a feminine pelvis, or a feminine voice? Is he real fat or real thin? Is the penis well developed or underdeveloped? What about the development of the thyroid gland? If you find any of these phenomena then you can feel sure that you are confronted with a case of deficient production of spermatozoa. The only way to be certain, however, is to operate on that man, cut down, see the testicles and particularly the epididymis, aspirate the epididymis tubule in several places. If you do not obtain any spermatozoa, then you know it is a production case and relief is impossible.

The transportation case will usually give a history either of injury or of infection. When you operate you should determine the point of obstruction, and naturally the operation necessary for relief depends on the anatomic location of the obstruction. If the obstruction is in the epididymis, either vaso-epididymostomy or rete testis union with the vas will be necessary, if in the scrotal vas, a resection and end to-end union, if in the pelvic vas, the author's sac operation or intradermal implantation of the vas should be performed.

The apparatus we use for direct uterine insemination is a special catheter with a capacity of about $1\frac{1}{2}$ minims. The patient is placed in the Sims position, the cervix exposed and grasped with a tenaculum, and the catheter inserted into the uterus through the cervical canal. This manipulation must be done with extreme gentleness or a severe uterine colic will result. The amount of semen injected is about 5 minims. If you inject more than 10 minims you are certain to have a severe reaction.

tozoa, provided, of course, you have made a check and found the spermatozoa normal in the condum or bottle

Head Conditions and Diseases in the Male Causing Childlessness—In the male there are two main elements to be considered first, the production of spermatozoa, and, second, the transportation of the spermatozoa. The production of spermatozoa is a very complicated physiologic process and defects may occur in any stage of the process. The production of spermatozoa depends on a great many factors: first, the age of the individual, second the hormone balance, third, the internal secretion balance, fourth, diet, fifth, general mode of life, sixth amount of sexual stimuli. One can modify spermatogenesis for the better to a certain extent by diet and exercise, and the feeding of some of the glands of internal secretion. I have never been able to bring spermatozoa into the semen that did not have some kind of spermatozoa present before. But where the spermatozoa are deficient in vital strength or deformed we have been able to improve their morphology and motility markedly by these methods. When the spermatozoa are first produced in the testicle they take an eosin stain. Sometimes you will find this condition persists and the ejaculated spermatozoa are eosinophilic. Something has interfered with the normal development of the spermatozoa to produce this change.

The Transportation of Spermatozoa—The route traversed by the spermatozoa from the testicle to the urethra is a long and tortuous one. In its course the spermatozoa comes into contact with many secretions. The first is the secretion from the epididymis. The epididymis is more than the simple tube it appears to be. It produces a thin glycemic like secretion that is essential to the proper development of the spermatozoa. Spermatozoa taken from the epididymis' tail will impregnate. Clinically, your male cases divide themselves into two classes—those where spermatozoa are present and those where spermatozoa are absent. The sperm present case we will put aside for a moment and take up the group where the spermatozoa are absent (azoospermia). The fact that spermatozoa are absent from the semen is all you can determine about this type of case clinically. As far as the sterility side is concerned you know right then and

CLINIC OF DR. WILLIAM M. HARSHA

ST. LUKE'S HOSPITAL

FRACTURES

S. S. H. S. Three cases illustrating the value of prudence and mechanical ingenuity in the treatment of fractures—method of correcting deformity by extension—a cast angular deformity overcome by cutting cast on concave side and bending to the necessary degree.

CASE I.—H. S., aged sixty-nine, admitted to the hospital October 25, 1918. Hurt the same day in an automobile accident sustaining a fracture of the surgical neck of the left humerus.



Fig. 19.—X-Ray findings in Case I.

There was the usual internal displacement of the upper end of the shaft toward the axilla with internal rotation but as seen from the plate (Fig. 19) no overlapping of fragments.



CLINIC OF DR. WILLIAM M. HARSHA

ST. LUKE'S HOSPITAL

FRACTURES

Summary Three cases illustrating the value of patience and mechanical ingenuity in the treatment of fractures—method of correcting deformity by extension in a cast—angular deformity overcome by cutting cast on concave side and bending to the necessary degree

CASE I—H. S., aged sixty-nine admitted to the hospital October 25, 1918. Hurt the same day in an automobile accident, sustaining a fracture of the surgical neck of the left humerus



Fig. 193.—X Ray findings in Case I

There was the usual internal displacement of the upper end of the shaft toward the axilla with internal rotation, but, as seen from the plate (Fig. 195), no overlapping of fragments

Rotary displacement can only be properly diagnosed by stereoscopic x rays

Under anesthesia the arm is abducted and rotated outward the fracture is easily reduced Extension is maintained by adhesive strips reaching from the site of fracture to the elbow with counterextension by a sling under the well padded axilla The entire arm flexed at the elbow together with the chest is



Fig. 196.—Method of reduction in plate-bond cast

now encased in plaster the upper arm in moderate abduction This leaves the hand free and in a convenient position for such use as it can serve with the arm fixed Fig. 196-19

Assuming we have a good position of the fragments the cat will not be disturbed for ten days when the cast will be cut from the lower arm so as to permit motion at the elbow In three weeks the outer half of the cast will be cut away exposing the shoulder and admitting of passive movement and massage of

all the arm and shoulder that is accessible. Traumatism about the shoulder, with too long fixation, may permanently impair function and at least unnecessarily delay the return of the arm to usefulness. At the end of another week the body cast will be removed, leaving only an angular splint support to the upper arm, which is maintained in position by a spica bandage or adhesive plaster. Further movement and massage will restore the use of the arm in about six weeks from the time of the injury.



Fig. 197.—x Ray plate after adjustment

CASE II—C. R., male aged forty admitted to St. Luke's Hospital October 9 1918. Was run over by heavy auto truck, the wheels passing over both thighs crushing both femurs, involving the middle and lower third of each. There was extensive comminution of both bones and severe crushing of the soft parts but neither fracture was compound. The patient was in rather profound shock, but rallied enough to warrant reduction on October 10th the day following the accident.

Reduction was made on the Hawley table which provides

for extension and counterextension abduction suspension at the knees and also for the application of a plaster cast by dropping the lower two-thirds of the table top (Fig. 198). A plaster cast was applied.

It was thought the cast extending from ankles to waist line with flexion at the knees would obviate the need of further ex-

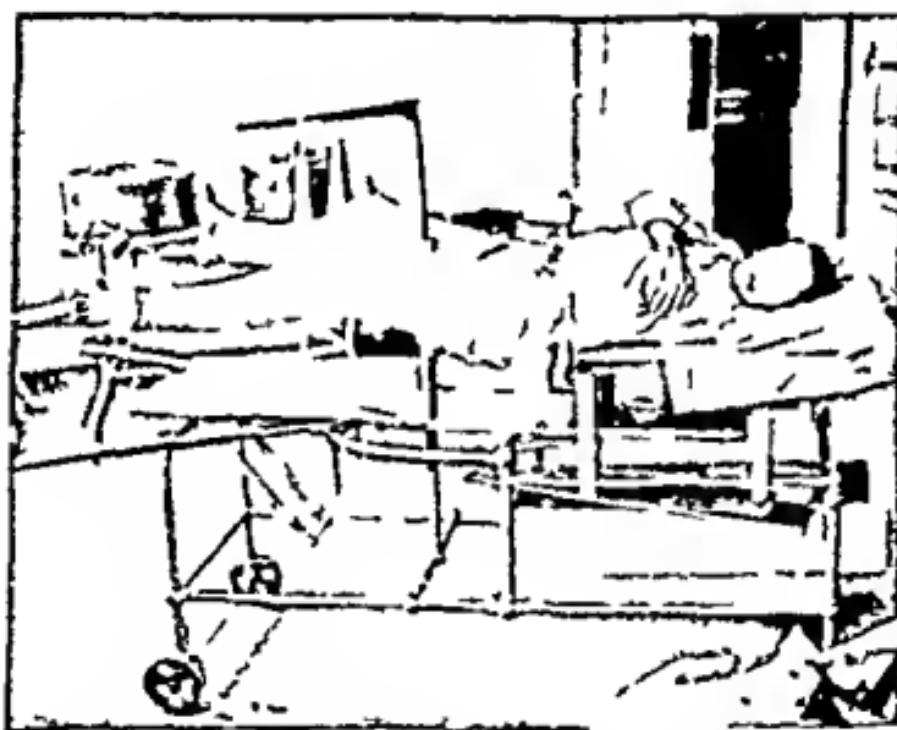


Fig. 198. Method of reduction with the Hawle table which provides for extension and counterextension abduction suspension at the knees and also for application of plaster cast by dropping the lower two-thirds of the table top (Case II).

tenion. This was true of the left leg which united without change of position of the fragment. The right however retracted before union took place and further correction was necessary.

The swelling of the limb was very great and when it subsided and the further atrophy of the muscles from disuse had occurred the cast did not fit closely enough to hold the right

leg in extension. It is necessary in such cases to provide for extension in addition to that afforded by the plaster.

It is the rule that a fracture after proper reduction and thorough fixation causes little pain. This patient suffered very little pain for a week or two after the reduction considering the magnitude of the injury. At the end of three weeks however he complained of severe pain in the right leg and on opening the cast the leg was found to be so reduced in size that the cast no longer held the fragments in position. The upper half of the cast was cut away longitudinally to the hip moleskin applied for extension to the sides of the leg up to the knee and after padding at the sides of the leg plaster of Paris was re applied including the lower half of the cast.

After this there was no further pain. The extension of 15 pounds was maintained for three weeks.

The x ray of the left leg after the cast was put on showed a slight deflection or angular displacement of the lower fragment. The cast was cut through in a circular manner about three fifths of the circumference on the outer or *concave* side of the displacement opposite the break and the angular displacement corrected by bending the uncut part of the cast. Additional plaster reinforced the cast.

This method of correcting fractures that present angular displacement after the application of a cast is much better than to remove the cast and try it over.

The left leg was left six weeks when the upper half of the cast was cut away longitudinally and massage and slight movement started. He now has good union in both legs with slight deformity in the right leg but only $\frac{1}{2}$ inch difference in length. In such cases it will not always be safe to rely upon the cast with some flexion at the knees to maintain the position. It will be sufficient in a simple fracture with little injury to the soft parts and little swelling but the greater swelling subsides and there is always some shrinking of the limb from disuse. The two facts soon make a misfit of the cast. Therefore it is safer to apply extension plaster at the beginning. By exposing the anterior superior spine of the ilium and the internal

malleoli, careful measurements will determine any difference in the length of the limbs.



Fig. 199.—Anteroposterior x-ray of left femur before reduction (Case II).

I do not know if the plan of correcting angular or longitudinal displacements after application of a cast, as described here, is new or not. If not new I have not seen or heard of it before.



Fig. 200.—Anteroposterior x-ray of left femur after reduction (Case II).

If the x-ray shows an angular displacement about one week should elapse before a correction is made. This is to allow time

for shrinkage of the limb somewhat and for some fixation of the broken ends of the bone (Figs. 199-204)

CASE III.—L. E., male aged twenty five aviator admitted to St. Luke's Hospital October 10 1918. His airplane fell 300 feet side slipping. He had several fractures including the upper alveolar process in front the rim of the left acetabulum with fissure of the acetabulum & Potts of the left ankle and a



Fig. 201.—Lateral x-ray of same limb (Fig. 200) after reduction and application of cast (Case II)

transverse fracture of the left humerus. Figure 205 demonstrates the condition of the arm as found in the x-ray which was taken October 10 1918 the day he entered the hospital. The fracture was reduced with a plaster body cast after the method described in Case I on October 19th nine days after the accident. The results after reduction are shown in Figs. 207 and 208.

Correction of the angular displacement was done, as in Case II, about a week after the cast was applied.

Only the last of the cases shown would have been easy to treat in an open manner by plate or wire. The anatomic result is good. He also has a good functional recovery.

The delay in putting it up in a plaster cast was because of the severe shock and great swelling.



Fig. 202.—Lateral X-ray of left femur after correction by cutting three-fourths of circumference and bending October 1st 1914 (Case II).

The body cast which I have used many times in fracture of the humerus, clavicle and scapula has seemed to fix and hold the fractures better than any device I know. It enables the patient to use the hand and fingers, and the patient is encouraged to do so.

The correction of the angular displacement is easily done by cutting the cast transversely *on the concave side* after the



Fig. 203.—Anteroposterior x-ray of right femur before correction (Case II)



Fig. 204.—x-R. 15-unit E.S. 03 after a 15-unit cast. Case II

swelling has had time to subside, usually about a week, being careful to leave one fourth of the circumference of the cast uncut and so placed that the bending will be properly directed.

By leaving on the moleskin plaster used for extension as shown in Fig. 196 (Case I) a longitudinal displacement can be corrected by cutting away the posterior half of the cast on both upper and lower arm, except to leave a cuff of the cast at the



Fig. 205.—x Ray of arm as it was found when patient entered the hospital October 10, 1918 (Case III).

wrist. After the cast has been so cut away extension is made on the arm and a pad placed between the forearm and remaining anterior splint. The body cast provides firm counter extension.

Open operation must often be resorted to where fragments cannot be approximated or held where there is intervention of soft parts or in ununited fractures. However there have been



Fig. 206.—The fracture as reduced with plaster body cast as shown in Fig. 196
(Case I) October 19 1918 (Case III)



Fig. 207.—Anterior-posterior X-ray after correction by cutting cast as in Case II
(Fig. 192) October 25 1918 (Case III)

many fatalities from what I believe to be too frequent open treatments, and in my opinion the number of cases requiring



Fig. 208.—Lateral view of same (Fig. 207) (Case III).

operation can be greatly reduced by patience and ordinary mechanical ingenuity.

CLINIC OF DR THOMAS J WATKINS

ST LLE'S HOSPITAL

THE CARE OF SUPPURATING WOUNDS FOLLOWING ABDOMINAL SECTION

Summary An infected laparotomy incision following hysterectomy for cancer—treatment by moist dressings—fallacy of removing sutures inserting drainage reopening wound and irrigation

The following case well illustrates many of the points which I desire to discuss in the treatment of infected wounds following abdominal section

Mrs G, aged thirty, was referred to me January 8, 1918. She had a large carcinoma of the cervix uteri which had been growing rapidly and which was bleeding profusely. No children. One miscarriage produced three years ago. The bleeding had existed for one year.

Upon examination the cervix was found to be from 2 to 3 inches in all diameters. 50 mg of radium were inserted, sutured into the cervix, and left for twenty four hours. A small amount of tissue was removed for microscopic diagnosis and found to be cancer. The Wassermann test was negative. One week later a radical operation was performed.

Sections of the tissue removed at this time did not show extensive changes from the radium which is usual as, clinically, not much change in tissue is found for at least one month following radium applications.

On the third day after operation the temperature was elevated and remained so for three or four days, when a large amount of pus escaped from the abdominal wound. Suppuration in abdominal wounds following hysterectomy for cancer is common as cancer of the cervix is generally infected and contamination is usual.

The treatment of suppurative wounds consists chiefly in an avoidance of the procedures which are commonly employed in such cases, that is, no sutures are removed, no drainage is inserted, the wound is not opened, and no irrigation is made. The treatment used is moist dressings, which are placed over the wound as soon as any evidence of infection is discovered. The wet dressings are covered by protective tissue or paper to prevent evaporation. They are changed as often as necessary to keep the wound comparatively clean. In this case they were continued for five days, at which time all induration and redness had disappeared and very little seropurulent discharge was present and the opening which remained was not larger than a moderate sized lead pencil. The abdomen was now strapped with adhesive plaster and dressed with dry gauze. The patient left the hospital at the end of the third week in good condition. Examination of the scar revealed no evidence that there had been suppuration.

This patient was examined March 15th, and there was no evidence of any exudate in the pelvis or loss of strength of the abdominal wall.

May 29, 1907 I read a paper before the Chicago Medical Society upon this subject which was published in the Illinois Medical Journal for September, 1907. This paper outlined the treatment of wounds such as described above. My treatment of such suppurative wounds has changed but little since that time, except that I have become more convinced of its value. The special advantages of this treatment over the usual treatment—removal of the sutures, opening of the wound, insertion of drainage, and irrigation—are

1. Very little injury is done to the wound by the suppuration.

2. The patient is disturbed very little physically or mentally. The treatment is entirely painless and the patient is assured that the suppuration is of very little importance.

3. The time required for the recovery of the patient is much lessened because when the suppuration stops there is very little wound left to heal.

Remarks.—The principles underlying this treatment I be-

heve, are entirely consistent with the modern ideas of infection and immunity. It is also based upon the results obtained by the treatment of wounds with and without antiseptics using control wounds for comparisons, which demonstrate that antiseptics injure the tissues more than they do the bacteria and delay recovery. There is a great advantage in not producing pain or causing the patient to worry, factors which are of much importance in the recovery, and of special value in the prophylaxis of postoperative neurasthenia.

Experience has shown that it is not necessary to remove sutures, as the wound will drain sufficiently through a very small opening if wet dressings are used, so that the discharge will not desiccate or coagulate and obstruct drainage. I have seen efficient drainage from extensive suppuration through the stitch hole of a tension suture.

The special advantages of not removing sutures are that it prevents injury to the wound and protects against hernia, and leaves a small wound for healing after suppuration ceases. The patient vaccinates herself with this treatment and thus has tens immunity. The sutures are removed when they start to cut the tissues. The wounds are not probed, as probing does not modify the treatment disturbs the patient, and may extend the infection. The wounds are not manipulated. Pressing of the wound endangers dissemination of the infection, produces pain and accomplishes nothing but harm.

The irrigation of wounds should be of historic importance only. It shocks our sensibilities to frequently observe irrigation of infected wounds. It is impossible to explain how this pernicious treatment can continue with the advance which has been made in surgery, with the knowledge that has been acquired in infections and immunity and with the research work which has been done relative to the dangers of the use of antiseptics in infected wounds. Aside from the above, antiseptics and irrigations mechanically remove much of the delicate wound repair tissue.

The use of gauze and tubing in suppurating wounds more often obstructs than promotes drainage. It is a common ob-

servation that considerable drainage often follows removal of rubber tubing or gauze which shows that it was acting as a cork more than a drain.

The persistence of a sinus means that there is a foreign body or necrotic tissue at the end of the sinus otherwise the sinus would not be present or would not persist. There is no object in keeping a sinus open as it will remain open as long as the foreign body or necrotic tissue remains and it will close spontaneously as soon as these disappear. The treatment of such sinuses is to keep them clean and allow the cause either to absorb or to slough out as the case may be. If they result from infected catgut they will persist until the catgut disappears. If due to silk or strands of gauze they will remain until the silk or gauze cuts through the tissues and escapes. If due to necrotic material they will persist until the necrotic tissue disappears.

The above treatment is employed in all cases of infected abdominal wounds.

CLINIC OF DR. ROGER T. VAUGHAN

COOK COUNTY HOSPITAL

HEMATOMA OF THE RIGHT RECTUS MUSCLE

Summary A patient presenting a swelling in the right rectus muscle of sudden onset with severe abdominal pain diagnosis treatment improvement under antiscorbutic management

The patient, an English laborer, aged forty nine, entered the Cook County Hospital March 8, 1918. The examining room diagnosis was "abdominal tumor."

Five days before entering the hospital the patient was suddenly seized with severe pains in the lower abdomen. The attack came on at night, the pain awakening him from sleep. He could not fall asleep again because of the pain. The next morning he took a cathartic on arising. Following the bowel movement the pain was somewhat relieved, but not entirely. Since then it has remained dull and gnawing in character, but is relieved considerably each time he has a bowel movement. The pain does not radiate to the back, shoulders, or genitalia. There have never been any sharp colicky exacerbations. The patient has not vomited, but has felt a little nauseated at times. After each meal since the onset of the pain there has been some feeling of abdominal distress about half an hour after eating. The pain has not varied with his position and has not been worse at night except the first night.

When the pain first set in the patient was sleeping in a room by himself with the door locked. He scouts the possibility of trauma. He claims that he never drinks to excess and has imbibed nothing alcoholic for three weeks. He works as a coal passer in a boiler room. The work is hard and exhausting and has always furnished him with a good appetite until now, practically irrespective of the kind of food. Since his abdominal

pain set in however he has eaten very little chiefly eggs milk and tea

For the past few days the patient has noticed that his urine is more highly colored than usual, but not smoky or bloody. He has had no pain on urination or increased frequency. He urinates once or twice at night.

Because of the pain the patient has not been able to continue his work as fireman since the onset of his present trouble. He denies any previous illness confining him to bed. He admits a chancre eighteen years ago, but no secondaries. He denies Neisserian infection.

Examination reveals a well-developed white male. Scalp negative.

Right eye apparently normal. Patient states his vision is O.K. Vision in left eye became poor three years ago and eye is now completely blind. He cannot even perceive light. Ophthalmoscopic examination shows a white, round tumor in the inner and lower quadrant of the vitreous and some detachment of the adjacent retina. The optic disk and the rest of the retina appear normal. There is a distinct indodonesia. No anterior or posterior lens reflex is present on ophthalmoscopic examination (dislocation of the lens into the vitreous). The left eye does not react to light, the right does. Ears and nose negative.

Pharynx hyperemic (smoker's pharyngitis). The teeth are in poor condition with much caries and many old snags needing removal. The gums are a little swollen but not distinctly blue or easily bleeding. The tongue is evidently slightly swollen since the teeth leave imprints on its sides. Tonsils submerged. Neck, heart and lungs negative.

Abdominal examination reveals a *tender, oval tumor mass in the right lower quadrant*. The skin shows a small area of *purplish discoloration* over center of the swelling. This discoloration does not change when pressure is made. There is no abrasion of the skin. No other palpable masses are present in the abdomen. The liver and spleen are not palpable. Abdominal rigidity is slight if present at all. This swelling can be grasped

hy the hand and moved rather freely from side to side when the patient's abdomen is relaxed and can to a much less extent, he moved up and down. When the patient lifts his heels from the table, thus contracting his recti muscles, the tumor at once becomes fixed and cannot be moved in any direction. It is, however, almost as definitely palpable as before the rectus muscles were tightened. We must, therefore, conclude that this tumor mass lies inside the right rectus sheath.

Gemitalia nervous system, spine, glands, and skin are negative.

Cystoscopic examination of the bladder was negative. Mucosa normal. Kidneys normal. Ureters normal.

Temperature 97° F on admission, pulse, 92, respiration, 20. The patient gives no history of fever or chills during his attack.

Urine Amher in color, specific gravity 1022, acid in reaction, no albumin or sugar, but a few red blood cells were seen with the microscope.

The Wassermann test on the blood was negative. White count 9200. Red count 4,100,000. Differential white count showed 65 per cent neutrophils, 21 small mononuclears, 9 per cent large mononuclears, 2 per cent eosinophils, 1 per cent basophils, 3 per cent transitionals. Red cells appear normal in contour and staining reaction.

Comments.—I was called to see this case as a possible abdominal surgical emergency because of the acuteness of onset, short duration and rapid development of the tumor, slight abdominal rigidity, anorexia, and nausea. The doctor who admitted him to the hospital was very conservative in his diagnosis of "abdominal tumor." He could not very well call it a case of acute appendicitis or peri appendical abscess because there was no leukocytosis and no fever.

Examination now reveals clearly that the tumor lies inside the rectus sheath. If we accept the man's statement that it is of five days' duration, it might be either a well walled-off inflammatory tumor or a collection of blood. Since there is no fever or leukocytosis and no evident source of infection, we must rule out an inflammation and conclude that this is a hematoma.

To further substantiate our diagnosis we see an ecchymosis in the skin over the center of the tumor. Is this central ecchymosis a traumatic affair or is it blood working its way to the surface from below? I see no reason for denying the man's statement that he has suffered no recent trauma. What object could be have in deceiving us? Furthermore, there is no abrasion of the skin to indicate a traumatic origin for this ecchymosis or the rectus hematoma, and the patient also has some blood in the urine as a further indication of a hemorrhagic diathesis. If he had had any systemic infection recently I might suspect that the hemorrhage is the result of Zenker's necrosis of the rectus muscle, such as we not infrequently see during convalescence from typhoid fever and other acute systemic infections, but he gives no such history. Therefore I must presume that he has developed a hemorrhagic diathesis of unknown origin, which because of the presence of deep muscle and fascial hemorrhage and the absence of cutaneous hemorrhages most resembles a mild scurvy. These characteristic deep fascial hemorrhages differentiate scurvy from the other forms of hemorrhagic diathesis. They are most frequent in the leg and thigh. They occur, as you know, in poorly fed men who are doing heavy work and suffering dietary hardships in addition. Most kinds of heavy labor entail muscular strain in the legs. The length and weight of the blood column here reaches its maximum, hence the frequency of scurvy hematomas in the leg muscles. Because of his occupation as a coal shoveler the man probably puts severe stresses on his rectus abdominis muscles. Is that why his muscle hemorrhage has occurred here? I think it is a likely explanation.

But we shall not operate on this "acute abdomen." The hematoma will not become infected and absorption of it will go right on. We shall presume that he has scurvy and put him on an antiscorbutic diet. Provided no other hemorrhages develop and rapid absorption of this hemorrhage occurs, he will not need to stay in the hospital, but can continue his treatment at home.

Subsequent Course — During the next three or four days the blood from the hematoma worked more and more to the surface,

and the whole tumor became somewhat greenish and purplish in color. The man was put on a diet of fresh vegetables and fruit, lemon and orange juices. Calcium lactate was administered. After six days' observation in the hospital he was allowed to go home to continue the same dietetic measures there. No further hemorrhagic phenomena developed up to the time he left.

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CLINIC OF DR. EDWARD LOUIS MOORHEAD

MERCY HOSPITAL

STRICTURE OF THE ESOPHAGUS: DISCUSSION OF THREE CASES

Summary Causes of esophageal stricture—the diagnosis—differentiation of functional from organic obstruction treatment, the Ssabanajew Frank gastrostomy

In presenting these 3 cases of stricture of the esophagus I want to take up with you briefly the subject of esophageal obstruction

Obstruction of the esophagus may be produced by causes from within the lumen of the esophagus or its wall, or by causes from without producing pressure upon the esophagus. Internal causes may be divided into, first, those caused by foreign bodies. Portions of food, corn, fish bones, pins, plates of false teeth, etc., are the substances usually met with. The patient complains that something has lodged in the gullet, causing a feeling of pain and distention, while swallowing is painful or impossible, and respiration may be more or less difficult. Large bodies are frequently impacted at the entrance to the esophagus and may cause sudden death from dyspnea, if the obstruction is not so great and remains unrelieved, it may give rise to edema of the glottis. Impaction lower down may be followed by ulceration, perforation, and death either from hemorrhage, owing to one of the large vessels being opened, or from suppurative cellulitis.

Inflammation of the mucous membrane may arise from in-

of pain on swallowing, and rarely attract attention unless the

ulceration is so extensive as to lead to the formation of a cicatrical stricture.

Paralysis of the muscular coat of the pharynx or esophagus is occasionally met with after diphtheria and may in rare instances be due to alcohol or lead poisoning. *Dysphagia* is always present, but it differs from that which occurs in stricture, in that solids are swallowed more easily than fluids. Sometimes the food collects and is ejected after a time by coughing or vomiting.

Hysterical paralysis is much more common the patient being convinced either that there is a foreign body in the esophagus or that there is a stricture (usually after having seen a case) and being unable to will the act of deglutition. It is chiefly met with in young women who present other hysterical symptoms but it may occur in men. The suddenness and incongruous nature of the symptoms the history, and a few days careful watching are sufficient to prevent a mistake. The greatest difficulty is in connection with foreign bodies, a fish bone perhaps has been actually swallowed and scratched the mucous surface, and the sensation arising from this and intensified when ever anything passes down is a sufficient stimulus to keep up the suggestion of dysphagia in the patient's brain. It rarely happens however that there is any collection of food above the obstruction either the patient keeps it in the mouth without attempting to swallow it, or, if it does pass over the larynx it is immediately ejected again often with an unnecessary display of energy.

Another condition, somewhat similar to this is a form of muscular spasm which affects the pharynx rather than the esophagus. It varies from merely a slight stammering of deglutition, such as might arise from simple nervousness to violent ejection of the contents of the pharynx through the mouth and nose. In neither of these conditions however whether paralysis or spasm is the prominent feature, is there marked emaciation or craving for food, the patient is usually fairly well nourished though always complaining (differing in this respect altogether from those who persistently refuse to take any food) and not

infrequently it is found on making inquiry that the difficulty has already lasted many years off and on, long enough to negative absolutely organic contraction.

Esophageal obstruction may be due to diverticula. A diverticulum is a localized distention of the esophagus with the gradual formation of a sac of greater or less extent lined by mucous membrane and blind at its distal end.

Diverticula are divided into two groups according to their causation: those arising from pressure from within pulsion diverticula and those arising from traction upon the esophagus from without traction diverticula.

Usually no symptoms are produced until the pouch has attained some size and food is retained in it. As its size increases the pressure of the distended sac tends to keep the normal orifice of the esophagus closed, thus producing dysphagia.

Symptoms are slowly developed, usually a little difficulty in swallowing any food, liquid or solid, a sensation of pressure and discomfort while eating and after. Patient may learn to eat slowly with the head in a certain position or to make certain movements while eating or to press with his finger upon some fixed point in the neck during the act of swallowing. Sometimes the first few mouthfuls are swallowed with difficulty, later the food goes down readily. Sometimes the condition is reversed. Regurgitation and vomiting of small quantities of unchanged food may occur without much effort or there may be quite violent gagging and retching, in either case relief follows.

Polypoid or other benign growths within the lumen of the esophagus may give rise to obstruction without producing a true narrowing of its caliber. These growths usually occur at the upper end of the esophagus and grow from the posterior wall occasionally at lower levels. If small usually no symptoms are produced but as they increase in size symptoms occur. They occur more frequently in men than women and usually develop during middle age or later in life. As a rule they are pedunculated and as they hang down in the esophagus swallowing movements tend to lengthen the tumor by traction. The symptoms are mod-

erate dysphagia a sensation of the presence of a foreign body sometimes a palpable movable tumor in the neck. If they are coughed up into the pharynx they may overlie the larynx and cause sudden choking and even asphyxia. Compression does not cause regurgitation of food into the pharynx differing in this from diverticula. They may cause vomiting or a desire to vomit after eating. Ordinarily the diagnosis is quite simple especially when the location of the tumor is high up by palpation with the forefinger the use of the laryngoscopic mirror or the esophagoscope.

Among the external causes producing esophageal obstruction may be mentioned inflammatory swellings enlarged lymphatic glands enlarged thyroid aneurysm of the arch of the aorta and tumors.

Organic stricture of the esophagus may be congenital or acquired. The former is exceedingly rare the latter which is very common may be simple or malignant.

Simple stricture arises nearly always from the swallowing of corrosive fluids. The mucous membrane sloughs and cicatrical contraction follows. Sometimes almost the whole length is obliterated in this way but the effect is always greatest at the commencement. In rare instances it may arise from some form of specific inflammation such as tubercle or syphilis. At the cardiac orifice it may arise from the healing and contraction of a gastric ulcer.

Malignant stricture is usually epitheliomatous in type and occurs during middle life and later. It is situated either at the junction of the pharynx and esophagus behind the cricoid cartilage or in the middle of the tube where it is crossed by the left bronchus or at the cardiac orifice of the stomach. The growth involves the whole circumference of the tube and sooner or later may ulcerate and perforate the trachea pleural cavity or one of the large vessels. Secondary deposits occur in the lymphatic glands either of the neck or posterior mediastinum visceral complications being uncommon.

Symptoms — The most prominent symptom of all strictures is difficulty in swallowing food. If the obstruction occurs sud-

denly, there may be total inability to swallow. If the obstruction is high up the effort to swallow is followed by immediate regurgitation through the nose and mouth. If lower down an interval may elapse before regurgitation occurs. If the obstruction is slowly formed, the symptoms gradually increase in severity. Cicatricial stricture following the ingestion of caustics are at first of an acute inflammatory character, with symptoms of more or less obstruction and all attempts to swallow attended by severe pain. As the acute inflammation subsides the symptoms of obstruction may entirely pass away, to be followed by gradually increasing difficulty in swallowing, which may not appear for some time and is not attended by pain. Fluids and soft foods are most easily swallowed and these patients learn to chew their food thoroughly, to eat slowly, and to swallow small quantities at a time.

Dilatation above the stricture often occurs, and food accumulates in the dilated part causing frequent regurgitation of food and mucus. As the obstruction increases the nutrition begins to suffer, and a severe grade of emaciation and anemia is finally reached ending in death from starvation unless relief is obtained.

The symptoms of malignant stricture are similar to those of benign stricture, but, in addition it occurs in advanced life, rarely before the fortieth year, most cases after the fiftieth year. Men are more often affected than women the proportion being 4 to 1. The physiologic narrowings are favorite sites. In most cases the tumor originates in the esophagus occasionally it is an extension from cancer of surrounding structures. The tumor may be small or large a portion of the wall only may be the seat of the disease in the early stages, but usually the entire circumference of the esophagus is involved.

Secondary tumors often form in the lymph nodes at the root of the neck and in the mediastinum. When the upper part of the esophagus is affected the growth may extend to the back of the larynx and cause hoarseness and even aphonia. Occasionally the pneumogastric nerves may be involved in the mass, leading to interference with the action of the heart, while in

plication of the recurrent laryngeal nerve causes constant cough and uni- or bilateral paralysis of the larynx.

The diagnosis of esophageal stricture can be made by the administration of a hismuth meal and radiography, especially by the use of the fluoroscope, or by examining the condition of the tube with an esophageal bougie. Great care must be exercised in the use of the bougie, as much damage may be done with it, especially in suspected malignant cases, where perforation of the wall may occur, giving rise to a fatal cellulitis. A malignant stricture usually feels rough and is painful, while a simple stricture is smooth, regular, and almost painless. It is not easy to distinguish malignant from simple stricture by the bougie alone. The history of the case, general condition of the patient, radiography, and the use of the esophagoscope will aid materially in making a differential diagnosis.

Treatment of cicatricial stricture is best carried out by dilatation with bougies of gradually increasing size. An interval of a few days should elapse between the attempts at dilatation, and during this period the patient should be given as much food as he can take, in the form of broths, eggs, minced meat, etc., or, if necessary, rectal feeding may be resorted to. If it is impossible to dilate, a fine rubber tube can usually be passed through the stricture by the assistance of the esophagoscope, and is maintained there for a time. The upper end is drawn out of the mouth and fixed. Feeding is rendered more easy, and the presence of the tube for a time gradually determines dilatation of the stricture. When the stricture is at the pharyngeal extremity, it may be possible to divide and subsequently dilate the stricture by the aid of the esophagoscope. If the stricture is located at the cardiac orifice of the stomach, the fingers may be used to dilate the stricture, after opening the stomach, as in gastrotomy. Where these measures have failed, the stomach may be opened and division of the stricture by the string saw attempted. The patient is made to swallow one end of a piece of string or a small shot may be clamped on a piece of silk, and allowed to find its way into the stomach. When the stomach is opened the free end is secured, and by this means a coarse

silk thread is carried through the obstruction by up and down sawing movements the stricture can be divided thus enabling

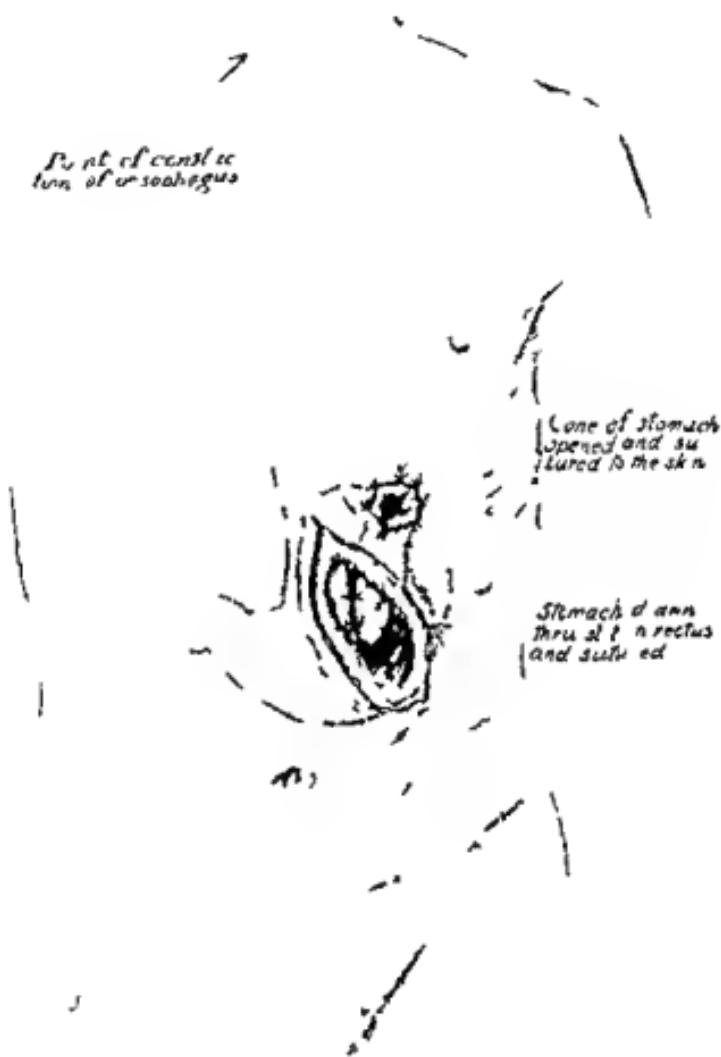


Fig. 209.—Modified Sabinajew Frank gastrostomy

the surgeon to introduce bougies. Gastrostomy is the final recourse. Occasionally when the esophagus has by this means been kept at rest for some time the stricture will yield and dilate

tation by bougies becomes practicable and the gastrostomy may be allowed to close (Fig. 209).

Treatment of malignant stricture is quite unsatisfactory. Dilatation by bougies should not be done for fear of increasing the ulceration causing severe hemorrhage or perforating the walls of the esophagus. In some cases dilatation may be done carefully to enable a tube to pass through the stricture for feeding purposes. Gastrostomy is likely to be required sooner or later and if done early may prove of great benefit to the patient.

Prognosis.—In cicatricial stricture the prognosis depends upon the general condition of the patient and the degree to which the stricture can be readily dilated. In malignant stricture the duration of the disease is from one to two years the patient dying as a result of the emaciation, anemic cathexis, starvation or earlier from perforation of the trachea, pleura, mediastinum or from hemorrhage.

CASE I.—Mr. F. M., aged forty-four, single German. Occupation brass finisher. Patient states that his sickness began four and a half months ago with pain in the chest located under the manubrium sterni. Pain was dull and aching in character and present only at times, usually in the morning on awaking but gradually wore off during the day. It was not influenced brought on or made worse by anything he knows of not increased by deep breathing or coughing. Pain has increased lately. Hoarseness has been present from the beginning. Onset sudden awoke one morning and found that he was very hoarse. Talking not painful but difficult. Difficulty in swallowing came on gradually. Unable to swallow any solid food all attempts being followed by regurgitation. Liquids go through if he drinks very slowly. Unable to work for the past six weeks on account of weakness due principally to his inability to take sufficient nourishment. He says that he has lost 25 pounds in weight since his illness began.

General history negative—no headaches, sleeps fairly well, no visual disturbances. Cough has been present for the last month. Brings up large amounts of rather thin yellowish sputum which has never been brown or contained blood. Cough

ing and expectoration have no influence upon the substernal pain. No dyspnea or swelling of the feet. Has had night-sweats for the past week. Becomes cold and then seems to have a fever. Toward morning he says he sweats for about an hour and then falls asleep. Appetite good, but unable to eat.

Past history. No special illness. Venereal history denied. Uses tobacco and drinks 4 glasses of beer a day. Father died at sixty five years of some heart trouble. Mother alive and well. Three brothers and three sisters all living and well.

Physical Examination.—Rather thin middle aged man, cheeks sunken, pale but does not appear acutely ill. Pulse 62, temperature 98° F. respirations 20. Blood pressure, systolic 110 diastolic 70. Pulse pressure 40.

Head, scalp and nose negative, ears cyanotic.

Eyes—pupils dilated equal react to light and accommodation. Eyes rather prominent. Ocular movements normal.

Mouth—lips pale and somewhat cyanotic. Tongue small and clean. Teeth many missing. Moderate pyorrhoea alveolaris.

Neck—cervical veins moderately dilated but equally so. No cervical adenopathy. No enlargement of thyroid. No tracheal tug. No rigidity.

Chest is symmetric. No visible pulsations. Expansion good and equal. No pretoreal dulness. Lungs are resonant throughout. No alteration in breath or transmitted voice sounds. No adventitious sounds. Heart borders within normal limits. Tones normal no murmurs.

Abdomen. No distention or rigidity. Liver and spleen not palpable. No palpable tumor masses or tender areas. Genitalia negative.

Extremities cold. Finger tips cyanotic. No edema or paralysis.

Reflexes. Pupillary, biceps, abdominal and patellar present on both sides.

Blood Hemoglobin 100 per cent, white blood cells 11,200. Wassermann negative.

Urinalysis—twenty four hour specimen. Quantity 800 c.c.,

tation by bougies becomes practicable and the gastrostomy may be allowed to close (Fig. 209).

Treatment of malignant stricture is quite unsatisfactory. Dilatation by bougies should not be done for fear of increasing the ulceration causing severe hemorrhage or perforating the walls of the esophagus. In some cases dilatation may be done carefully to enable a tube to pass through the stricture for feeding purposes. Gastrostomy is likely to be required sooner or later and if done early may prove of great benefit to the patient.

Prognosis.—In cicatricial stricture the prognosis depends upon the general condition of the patient and the degree to which the stricture can be readily dilated. In malignant stricture the duration of the disease is from one to two years the patient dying as a result of the emaciation, anemic cachexia, starvation or earlier from perforation of the trachea, pleura, mediastinum or from hemorrhage.

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General history negative—no headache, sleeps fairly well, no visual disturbances. Cough has been present for the last month. Brings up large amounts of rather thin yellowish sputum which has never been brown or contained blood. Cough

about 8 inches from the incisor teeth. When this patient first came to the hospital I advised a gastrostomy but he refused. He returned to his home and now comes back to ask for some relief outside of operation. There is none and in his case operation will do no good as he has waited too long. The degree of emaciation is so great the patient has practically starved that the prognosis in his case is very bad. If anything is to be done for these cases it must be done at a time when there is some chance of keeping up their nutrition. Two years is perhaps the limit of time for them under the most favorable conditions whether operated or not. No one has been able to convince this man what his trouble is. He has his own idea of it and while I tried at our first meeting through the interpreter to convince him of the gravity of his case it was of no avail. Probably if consent had been obtained six months ago for operation his condition might have been better today and his life prolonged for a little while with some degree of comfort.

CASE III—Mr. D. aged fifty two years single American Laborer. This patient gives practically the same history as the two preceding cases. There is not much difference in the story they tell you of how their trouble began and of its progress up to the time when they were unable to swallow any food. His illness began about two months previous to his operation and he is shown to you now (thirteen months following the operation) that you may see the results.

The esophageal stricture in this case is in the same location as the one shown by the *en*graph (Case II). Unfortunately the plates in this case have been lost or mislaid and cannot be found at present.

The patient looks fairly well says he feels well and is able to go about and do some light work. Up to the present he has held his weight fairly well how long it will continue we cannot say. He takes a liberal amount of nourishment through the gastrostomy tube and takes very good care of himself.

There have been several methods devised for performing gastrostomy. In all of them the object aimed at is the establishment of a tube leading into the stomach through which a

specific gravity 1028 alkaline no albumin no sugar few white blood cells and bacteria

Radiographic examination shows esophageal obstruction at level of sternal notch apparently due to malignant stricture

This patient was in the hospital about three weeks ago at which time he was given a braided silk thread to swallow. After the thread was well anchored dilatation was attempted with olive-tipped dilators. This was not very successful as slight hemorrhage occurred each time.

You will please notice the efforts the patient makes when he tries to drink water. Unless he does it very slowly it will at once bring on coughing and regurgitation. He is unable to swallow any solid food.

There is no question as to the diagnosis in this case neither is there as to the proper treatment. The patient was advised to submit to a gastrostomy before but he has delayed it and now returns for operation. The operation which will be done in this case will be the same as that done in the third case which I shall show you this morning.

CASE II—Mr F Z, aged forty-eight years married. Slavic Occupation metal polisher.

This patient gives a history of having difficulty in swallowing for the past six months. Previous to this time as far as can be learned his health was good. He has lost considerable weight. Says he is hungry but unable to swallow any food. He locates with his finger the point at which all food or liquid stops and through the interpreter asks that I push something through it.

Physical examination of the patient is negative except for the emaciation as a result of lack of nourishment. Wurmian negative. We will have him try to drink some water and you can readily see the difficulty he has and his inability to swallow the water promptly regurgitating through the mouth and nose. He complains of considerable pain at the point of stricture and upon examination of the neck there is found some thickening about the lower border of the larynx. We have been unable to pass anything in the line of bougies through the stricture.

Radiographic examination shows a stricture of the esophagus.

about 8 inches from the incisor teeth. When this patient first came to the hospital I advised a gastrostomy but he refused. He returned to his home and now comes back to ask for some relief outside of operation. There is none and in his case operation will do no good as he has waited too long. The degree of emaciation is so great the patient has practically starved that the prognosis in his case is very bad. If anything is to be done for these cases it must be done at a time when there is some chance of keeping up their nutrition. Two years is perhaps the limit of time for them under the most favorable conditions whether operated or not. No one has been able to convince this man what his trouble is. He has his own idea of it and while I tried at our first meeting through the interpreter to convince him of the gravity of his case it was of no avail. Probably if consent had been obtained six months ago for operation his condition might have been better today and his life prolonged for a little while with some degree of comfort.

CASE III—Mr. D aged fifty two years single American Laborer. This patient gives practically the same history as the two preceding cases. There is not much difference in the story they tell you of how their trouble began and of its progress up to the time when they were unable to swallow any food. His illness began about two months previous to his operation and he is shown to you now (thirteen months following the operation) that you may see the results.

The esophageal stricture in this case is in the same location as the one shown by the skirgraph (Case II). Unfortunately the plates in this case have been lost or mislaid and cannot be found at present.

The patient looks fairly well says he feels well and is able to go about and do some light work. Up to the present he has held his weight fairly well how long it will continue we cannot say. He takes a liberal amount of nourishment through the gastrostomy tube and takes very good care of himself.

There have been several methods devised for performing gastrostomy. In all of them the object aimed at is the establishment of a fistula leading into the stomach through which a

tube can be passed and food introduced into the stomach and the avoidance of leakage of the fistula with consequent irritation of the skin of the abdominal wall by the gastric juice. Two methods of attaining this result have been attempted the formation of a valve from the stomach wall as in the Stamm Kader and Witzel methods the use of a portion of the stomach wall pulled out of the abdominal cavity between the muscular layers of the abdominal wall in an attempt to obtain a sphincteric action of the muscle as in the Jaboulay and Hartmann or the Frank Ssabanajew Albert methods.

In this case the Ssabanajew Frank method was used. A skin incision is made 3 inches long parallel to the left costal margin and 1 inch below it. Divide the left rectus muscle and sheath vertically and pull out a cone of the stomach from as near the cardia as possible. See that the area pulled out is sufficiently long without tension for the following procedure. Insert a traction suture in the apex of the stomach cone. Under mine the skin to a point above the costal margin. Make a small incision over this point and pull the apex of the cone of the stomach through this opening without tension. Suture the stomach wall of the base of the cone to the parietal peritoneum and posterior rectus sheath. Suture the rectus muscle and anterior sheath from below upward leaving the upper part of the stomach cone passing between the upper separated rectus fibers above for sphincteric action. Close the skin of the first wound. Make a small opening in the apex of the stomach cone and suture the edges of the opening to the skin.

Kocher modified this method by retracting the rectus muscle outward instead of splitting its fibers and then using the Witzel method of inserting the catheter instead of pulling out the apex of the cone of the stomach wall above.

The objection to the method used in this case is the amount of stomach wall employed it being impracticable in a small contracted stomach.

GONORRHEAL SPUR ON THE OS CALCIS

Summary A patient complaining of painful heel with a history of specific urethritis twenty nine years ago diagnosis treatment by removal of spur

MR J M aged sixty four years married Scotch Occupation machinist Gives the following history About three years ago he states that every morning when he would stand upon his left foot there would be considerable pain in the left heel The pain was increased upon walking but did not bother him at night while lying down This condition persisted for about one year during which time he resorted to various methods of treatment ointments massage etc About five months ago there was a return of his former symptoms and for the past three months the pain has increased in severity so much so that at the present time he is unable to walk any distance or stand on the foot for any great length of time

Past History—Usual diseases of childhood

Genital History—Gonorrhea twenty nine years ago Syphilis denied

Family History—Father died of a fever the nature of which he does not know aged forty three Mother died at seventy three He has four brothers and two sisters living and well

Physical Examination—Reveals a well nourished and healthy looking man not apparently acutely ill Pulse 80 temperature 99 respirations 18 Blood pressure systolic 145 diastolic 100 Pulse pressure 45

Urinalysis—Specific gravity 1020 reaction alkaline, no albumin sugar or casts

Regional Examination—Head and scalp—scars over left temporal region otherwise negative

Ear—left ear complete deafness right ear negative Large amount of wax

Eyes—no ptosis or nystagmus Conjunctiva and sclera not injected Pupils regular and equal and react to light and accommodation

Nose—negative

Mouth—teeth fairly good, tongue clear, tonsils present

Neck—palpable submaxillary gland, no abnormalities

Chest and thorax—inspection shows a large amount of hair, well developed. Palpation percussion, and auscultation negative. Heart—borders normal, tones clear, no murmur.

Abdomen—pendulous, large amount of fat. Scar from hernia operation on left side.



Fig. 210.—x Ray showing spur on the os calcis.

Extremities—left leg negative. Right leg evidence of varicose veins, small painful area over heel of left foot. Pain increased upon standing on foot or walking.

Genitalia—negative

Reflexes—negative

Adenopathy—palpable submaxillary glands, inguinal glands slightly palpable.

The x ray plate of left foot shows a spur of bone on the inferior and inner aspect of the os calcis, about $\frac{1}{2}$ inch long with a base of about $\frac{1}{4}$ inch (Fig. 210).

The diagnosis in this case is a gonorrhreal spur resulting from an irritative periostitis.

Gonorrhreal periostitis is fairly frequent in certain localities especially under the calcaneus in which situation spurs result from the inflammation. These bony spurs should be chiseled away. A peculiar condition of sensitive feet found occasionally in patients with chronic gonorrhea is probably due to a mild



Fig. 211.—Os calcis exposed through slightly curved horizontal incision showing spur on bone about to be removed with a chisel which has caused the symptoms.

degree of periostitis. The patients walk as if they were treading on eggs.

Operation.—These patients should receive special preparation before operation. In this case the foot has been subjected to a prolonged bath and the application of a sterile dressing daily for several days. It is rather difficult to sterilize the field of operation in these cases. Regarding the incision we can make either the median incision over the Achilles tendon and

into the sole, as described by Landerer, or a slightly curved horizontal incision on the inner side of the heel. The objection to the median incision is that the scar lies in part on the plantar surface and may prejudice walking. In this case I will make the horizontal incision about $2\frac{1}{2}$ inches in length. Care must be exercised to avoid injury to the posterior vessels and nerves. The flap of the heel is retracted downward and the spur of bone on the os calcis is readily felt with the finger. With the chisel on the flat, by a few strokes with the hammer the spur is detached from the os calcis, and it corresponds in shape and size with the x ray plate. The incision is closed with silkworm gut sutures and the usual dressing applied (Fig. 211).

Note—This patient was seen two months following operation. He has had no further pain or discomfort in the heel.

CLINIC OF DR. CHARLES E. HUMISTON

WEST SUBURBAN HOSPITAL

DEMONSTRATION OF FIVE CASES

Summary Case I—Osteomyelitis of both tibiae with destruction of the upper half of each bone present condition after two years

Case II—Indirect gangrene of both feet from thrombosis of the popliteal arteries. Amputation of both thighs. Present condition after one and a half years

Case III—Ulcer of the stomach—pyloric obstruction. Gastro-enterostomy—symptomatic cure—recurrence of ulcer symptoms after five months—anastomotic opening patent

Case IV—Fracture of the surgical neck of the humerus in a child of five years—open treatment—technic

Case V—Hour glass stomach—adhesion to abdominal wall—technic of operation

April 5, 1919

CASE I—F. W., aged ten, the younger of two children came under my observation two years ago

The family history reveals the patient to be the posthumous child of a father dead at forty two of paresis. The mother and an older brother are living and well.

The onset of the trouble which led to the present condition began in January 1917 with a sore throat soon followed by severe pains in the legs which in a few days showed red spots on both shins just above the shoe tops. These red spots never came to a head. There was marked swelling, pain and tenderness of both legs to above the knees. The condition is said to have been regarded as rheumatism and to have received medical treatment for six weeks at the end of which time a consultation led to a correct diagnosis.

I first saw the patient on his admission to the West Suburban Hospital March 21, 1917 eight weeks after the beginning of his illness. He presented the clinical picture of extreme



Fig. 212—Case I. x-Ray examination of right and left before operation by Dr. Edward S. Blane. Right leg. The upper half of the shaft of the tibia is involved in extensive osteomyelitis. There is sequestra and abscess formation. The process has crossed the epiphyseal line and involves the entire epiphysis. The fibula shows no changes whatever the process has not involved this bone. The lower half of the tibia appears approximately normal. No changes appear to involve the femur except an atrophy. The above description fits almost identically the condition found in the left leg. The extent of involvement is approximately the same.

sepsis and emaciation. Both legs were swollen and there was subluxation of both knee joints. Both legs showed fluctuation from the knees to below their middle. Pus was oozing from a puncture on the anterior aspect of each leg. x Ray examination showed almost complete destruction of the upper half of each tibia including the epiphysis with both knee joints invaded (Fig 212).

Wassermann test by Dr Frances Chapman proved negative.

Operation was done under gas anesthesia March 26 1917 both legs being dealt with alike. Incision over the anterior upper aspect of the tibia resulted in a gush of pus bone shreds and debris that left practically nothing but cavity where had been upper tibia. Palpation of the walls of the cavity disclosed thin irregular remains or deposits of bony tissue. The condyles of the femur were visible and bare. Stuffing the cavities with gauze and placing the lower limbs in molded posterior plaster of Paris splints the patient was put to bed.

Slow convalescence followed. The walls of the tibial cavities were prevented from falling together by a scaffolding of gauze. The pus discharge rapidly diminished and the x ray showed a beginning growth of new bone. The patient left the hospital May 19 1917 with both wounds open (Fig 213).

He returned for a second operation October 25 1917 when I resected the left knee. A thin shaving of worm eaten bone was removed from the lower extremity of the femur and a somewhat thicker slice taken off the upper end of the renewed tibia. This new bone was soft and porous. The patella was excised. Chromic catgut sutures were used to maintain bony approximation. The wound was closed without drainage as this limb was no longer septic. A posterior molded plaster of Paris splint was applied to secure immobilization. Clean union followed. Nothing was done with the right knee which showed some degree of motion but like the left one was dislocated backward.

At present there is firm bony ankylosis of the left knee. The boy can bear his weight on either limb but better on the left one which is 2 inches shorter than the right. He can walk without cane or crutches goes to school and is growing rapidly.



Fig. 21. Case 1. (Continued)
by Dr. Edwards.
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No changes appear to involve the femur except an atrophy. The above de-
scription fits almost identically the condition found in the left leg. The extent
of involvement is approximately the same.



Fig. 214.—Case 1. x Ray examination of left leg two years after operation. Left leg. Evidence of extensive old practically healed osteomyelitis involving the upper half of the shaft of the tibia and the lower epiphysis of the femur with firm bony ankylosis. There has been considerable regeneration of bone but there is a large foramen in the upper portion of the shaft of the tibia from failure of complete regeneration. The distal half of the shaft of the tibia shows considerable atrophy. The fibula shows no involvement of its shaft and but slight involvement of its upper epiphysis. The fibula is dislocated proximally and medially. The patella is entirely wanting.

This case well illustrates a child's ability to grow new bone. The tragedy of these legs is an eloquent appeal against the all too common diagnosis of "*rheumatism*."

The dislocated right knee is a p-eudarthrosis with nearly 90 degrees of motion. The mother is unwilling that any further



Fig. 213.—Case I. X Ray examination of both legs three months after operation. There is definite evidence of beginning bone regeneration. The condition is apparently good. Only one leg is pictured here as the other was similar to this.

surgery be undertaken and for the present I am willing that she shall have her way (Figs. 214 and 215).

—the left one was normal in this respect. There had been no accident or injury and aside from typhoid fever when twenty years of age no previous illness. Venereal disease was denied. He was married at twenty two and 6 of his 7 children are alive and well.

Ten days before entering the hospital the patient was seized with sudden stinging pain in the calf of the right leg. This occurred while walking along the street. Three or four days later the toes turned black. The foot became cold and gradually changed in color. There was no pain.

On July 7 1917 amputation of the lower third of the right leg was done. The patient would not consent to a higher amputation—in fact was unwilling to have any amputation but at length was persuaded to submit to having the dead part removed. The gangrene did not extend above the ankle and no good line of demarcation had formed. The stump was anemic and the flaps sloughed. After the lapse of five weeks the patient was ready to consent to an amputation anywhere that would stop the offensive process.

On August 24 1917 amputation of the right thigh was done in the lower third. The popliteal artery was thrombosed and though I ligated it ligation was not really necessary. The collateral circulation was fairly good however and this time a good result was obtained.

A few weeks after leaving the hospital the patient telephoned me that his other foot had gone wrong. Investigation disclosed beginning gangrene. This time the patient insisted on a thigh amputation and accordingly on November 7 1917 I amputated the left thigh well above the knee and again found a thrombosed and solid popliteal artery. Healing by first intention followed.

It is now about seventeen months since the last amputation. The patient has regained robust health. He now weighs more without his legs than formerly with them. His eye is bright and his voice equal to that of an auctioneer's. His heart and arteries are about what they should be at seventy. There is no sugar in the urine and never has been. An albuminuria present



Fig. 215—Case I. Right leg. The changes in the upper part of the shaft of the tibia are about the same as in the left. The upper epiphysis of this bone is not so great in size. The lower epiphysis of the femur on this bony side remains intact.

The patella on this side remains intact.

CASE II—J. F. J., aged seventy, was admitted to the hospital in July 1917 with the following history:

For the past two or three years the right foot got cold easily.

There is evidently good drainage of the stomach and no obstruction as a reason for gastric spasm. It does not appear



Fig. 216—Case III. Gastro enterostomy opening patent and functioning. The contents of the stomach will empty through this opening much more rapidly than if there were a normal functioning pylorus. View taken with a five minutes after the administration of 400 c.c. of barium mixture shows that over half of the same has left the stomach. No evidence of ulceration at site of gastro-enterostomy opening. The pyloric end of the stomach and posterior portion of the antrum seem disturbed by adhesions. The cap of the duodenum does not fill.

that the pyloric function has been restored (Fig. 216). Either the pylorus is still obstructed or the gastrojejunostomy offers such easy egress for the stomach contents that the pyloric gate-

two years ago has disappeared. All three amputations were done under gas anesthesia.

This case is shown mainly to illustrate the futility of amputation below the knee in gangrene of the foot if the patient be old and the gangrene does not soon show a well-defined line of demarcation, 3 or 4 inches of healthy looking skin is not sufficient to guarantee vitality in the stump. If the deeper tissues are ischemic—go higher. My second amputation should have been done under the first anesthetic.

CASE III—Mrs. C. B., aged thirty-eight, entered the hospital April 1, 1919, with a history of having vomited blood for the previous two weeks. She complains of localized pain and tenderness in the epigastrum. The pain is greatly aggravated upon taking food. The amount vomited is not great at any one time nor in the aggregate.

The previous history shows the patient to have been a stomach case for several years. Two years ago she was a patient in this hospital at which time I removed an acutely inflamed appendix. She was back in the hospital in October, 1918, when I did a gastro-enterostomy for a pyloric stenosis due to ulcer. Following this operation she was very well until two weeks ago when the present illness began.

Investigation reveals that the patient had so regained confidence in her digestive ability that she had decided that there was no longer any necessity for observing any restrictions as to the character or the quantity of food to be eaten at any one time. The onset of the present trouble seems to have had a definite beginning after a round of feasting when salads and other chemical irritants were indulged in freely.

General physical examination is negative except for a point of tenderness in the epigastric region an inch to the right of the midline. The state of nutrition is good plus. The ruddy complexion and the rotund figure bespeak overnourishment rather than the opposite.

Roentgen examination discloses prompt evacuation of the stomach contents into the intestine through the artificial junction made five months ago between the stomach and the upper jejunum.

of this region must be safeguarded. Using the prominence caused by the displaced upper extremity of the lower fragment as an objective the bone is uncovered without much difficulty flexing the arm at the false point of motion thus causing the upper end of the lower fragment to protrude. I am enabled to



Fig 217. Case IV. Fracture of the surgical neck of the right humerus with internal and upward displacement of the lower fragment making an overriding of more than an inch.

uncover the upper fragment which lies deeply in the wound and is freed with some difficulty as the fracture is in reality nearer the tuberosity than the x ray makes it appear to be. There is an overriding of $1\frac{1}{2}$ inches.

The pectoralis major, teres major, latissimus dorsi and coracobrachialis aided by the biceps and the triceps are drawing

way is unnecessary. That is extremely improbable however as the artificial cut from the stomach is the one to close when there is a patent pylorus. The symptoms point rather conclusively to peptic ulcer either a persistence of the ulcer found five months ago and which appeared to have healed or possibly to another and later ulcer. Internists tell us that gastric ulcer is a medical disease which may become surgical. This case now reverts to a medical phase and I have asked Dr. Ellis K. Kerr to outline a course of medical treatment. The patient will receive the following diet:

Milk 1½ ounce cream 1 ounce every hour from 7 A.M. to 7 P.M. As an alkali she will be given a powder consisting of 10 grains each of sodium bicarbonate and calcined magnesia and 5 grains of bi-muth subnitrate one-half hour after food.

The milk and cream mixture will be increased after a few days and egg and cereal will be added gradually.

The withdrawal of irritating foods together with the good drainage of the stomach which is evident in this case should yield favorable results. However if we meet disappointment with this line of treatment pyloromyotomy will be done.

CASE IV A D. aged five referred by Dr. A. R. McDonald was admitted to the hospital with the following history. A few days previously she fell off a low porch and sustained a fracture of the surgical neck of the right humerus (Fig. 217). A Scudder dressing consisting of a shoulder cap, axillary pad and a sling which was subsequently reinforced by a weight of 3 pounds failed to secure good apposition. An attempt at reduction under anesthesia and dressing with Middeldorp's triangle likewise failed to hold the fragments in proper position. Accordingly an open operation was decided upon which we shall now proceed to do. The operation has been delayed five or six days because the child was suffering from an acute cold. It is now two weeks since the fracture occurred.

Incision along the anterior border of the deltoid affords the best approach. Immediately a large vein, the cephalic comes into view. I am deepening the incision using the edge of the knife with caution as the many important nerves and vessels

sion a closure of the skin completes the operation. A wedge shaped pad in the axilla with its base downward permits fixing the arm to the chest while a shoulder cap avoids the danger of direct injury and also aids in immobilizing the shoulder. Passive movements will be begun after two weeks and followed up with increasing vigor and frequency for after all the function

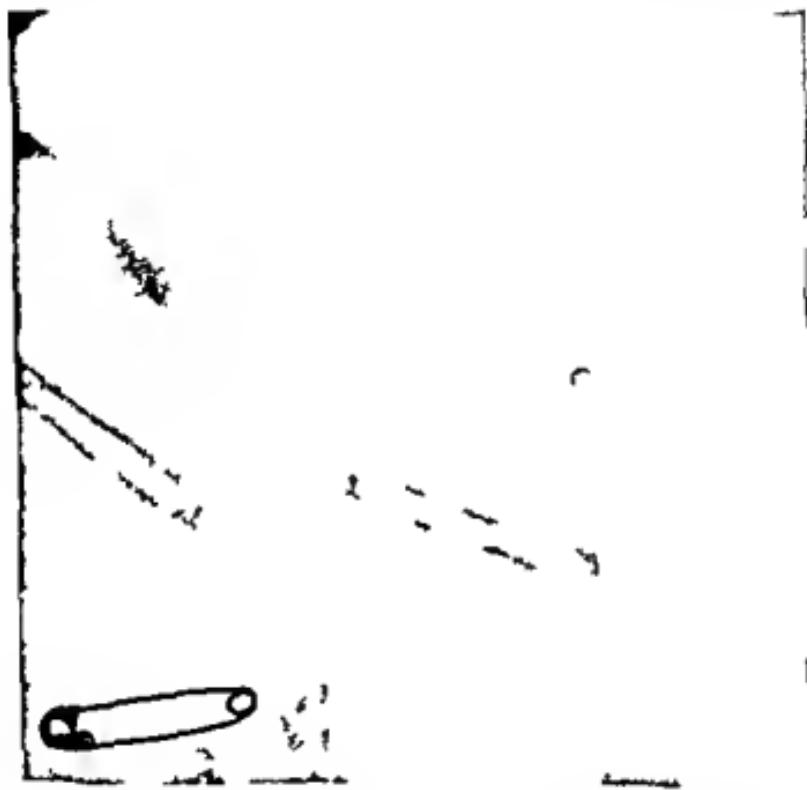


Fig. 218—Case IV. Fracture of the surgical neck of the right humerus. Good though not perfect approximation of the two fractured surfaces. Evidence of callus formation shown all about the point of bony contact. X-ray plate made ten days after operation.

of the shoulder joint is of prime importance in this class of fractures (Fig. 218).

CASE V. Mrs. M. P. aged forty, entered the hospital in April 1919, suffering from persistent vomiting.

The family history shows father, mother, five brothers and two sisters living and well.

the lower fragment forcibly upward and inward, while the supra spinatus, infraspinatus, and teres minor are busily engaged in rotating and pulling the upper fragment upward, outward and backward. These opposing forces must now be dealt with.

By grasping the upper fragment with forceps, being careful not to crush the little bit of shaft remaining, which is already somewhat comminuted, and manipulating the lower fragment as part of the whole limb below the point of fracture at the same time making judicious use of this wooden handled screw-driver as a lever, we are enabled to bring the fragments into fairly good anatomic position. It is to be observed that it is necessary to rotate the lower fragment outward in order to fit the irregular projections of the one fragment into their corresponding depressions of the other. Having thus secured reduction any tendency to redislocation of the fragments is resisted by the irregular dovetailing at the line of fracture.

In many cases restoring the fragments to accurate and correct anatomic relationship with each other in other words, *open reduction* is the only open treatment required. In this case, however, I think something more should be done as the line of fracture is not sufficiently irregular to prevent a recurrence of the displacement if a little injudicious force should happen to be applied and we must bear in mind that this patient is little more than a baby and will forget this arm when it no longer causes pain. Furthermore the lower end of the upper fragment is somewhat comminuted and some of the fragments are now missing so that the two fractured ends do not fit as well as is the case many times. The surface on the upper fragment is larger than that on the lower. I am able to get good contact but not perfect alignment.

Drilling each fragment and tying them together with kangaroo tendon seems to promise enough support to preserve reduction here, and this procedure will less likely require any subsequent operative interference. The kangaroo tendon will prevent rotation of one fragment without the other and it will last as long as any artificial support is likely to be needed.

As no important structures have been divided in this inci-

sion, a closure of the skin completes the operation. A wedge-shaped pad in the axilla with its base downward permits fixing the arm to the chest, while a shoulder cap avoids the danger of direct injury and also aids in immobilizing the shoulder. Passive movements will be begun after two weeks and followed up with increasing vigor and frequency for after all, the function



Fig 218—Case IV. Fracture of the surgical neck of the right humerus. Good though not perfect approximation of the two fractured surfaces. Evidence of callus formation is shown all about the point of bony contact. x Ray plate made ten days after operation.

of the shoulder joint is of prime importance in this class of fractures (Fig. 218).

CASE I.—Mrs. M. P. aged forty entered the hospital in April 1919 suffering from persistent vomiting.

The family history shows father mother five brothers, and two sisters living and well.

The previous history is as follows. She had some severe abdominal trouble when about fifteen years of age which was called inflammation of the bowels. She was married at twenty nine no pregnancy. In 1916 she had a hysterectomy for fibroid tumor of the uterus. At this time extensive fibrous intestinal adhesions were noted. The adhesions were thought to be from an old tuberculous peritonitis. One year ago the patient was again in the hospital for intestinal obstruction at which time the lower half of the abdomen exhibited a mass of interintestinal adhesions. Many bands of adhesions were liberated and following this operation the patient as she says was doing pretty well.

In October 1918 the patient suffered an attack of influenza which kept her in bed for six or eight weeks. As she began to recover a little strength following this illness stomach symptoms began to assert themselves. Vomiting became more frequent until recently when practically nothing is retained by the stomach. The vomiting occurs immediately upon taking food. There is much mucus but no blood and the condition is not painful. The patient is not constipated but she is hungry all the time and her state of nutrition is at a very low point.

x Ray examination of the stomach on December 30 1918 previous to the attack of intestinal obstruction was practically negative—no six hour residue no evidence of ulcer or other lesion.

x Ray examination now shows an hour glass stomach. The lumen of the stomach at the point of constriction is almost obliterated. The barium meal given at the first examination is after twenty four hours mostly retained in the cardiac end. It is evident that the only nourishment which this patient has been getting recently is the little bit of thin liquid that would seep through this constriction which is to the pyloric side of the middle of the stomach (Fig 219).

Rectal feeding has been carried out for the last three days. This feeding has consisted of water sodium bicarbonate and glucose—the main thing is the water. While the patient is little more than a skeleton still she is able to walk.

The patient is about ready for the operation to begin. She has had a small dose of atropin on account of an excess of mucus but no morphin. I am making a median incision from the ensi



Fig. 219. *Hour glass stomach note marked constriction just distal to the middle of the stomach*

form downward. What this operation will consist of must be determined as we proceed. I cannot incise the peritoneum in the usual manner as there are firm adhesions beneath so firm

in fact that the peritoneum is torn away from the abdominal wall and remains adherent to the viscera. At the lower end of the incision I have now succeeded in gaining entrance to the peritoneal cavity. There is adhesion of the stomach to the abdominal wall so firm indeed that to get a free opening I shall



Fig. 220.—Case V. At operation note wide constricted zone in stomach confirming deductions made from the x-ray analysis.

have to resect some of this peritoneal and propertitoneal tissue and permit it to remain attached to the stomach (Fig. 220). There is such a conglomeration of adhesions among the intestines and omentum to the abdominal wall and between the different loops of bowel that a good exposure cannot be had. The stomach seems shriveled and leathery as if it had been

soaked in a formalin solution. The constricted portion is flat and irregular and certainly longer than it appears in the x ray plate. At one place in the isthmus between the two extremities there is a thickened region which perhaps is the scar of a bealed ulcer. A strong band of adhesions stretches from the margin of the liver at the region of the gall bladder to the transverse colon just to the left of the midline. In endeavoring to separate this I have inadvertently torn the edge of the liver which for some strange reason oozes only slightly. A suture ligaure easily placed about this torn part effectually takes care of it.

To resect this stomach would mean to remove more than half of it and as there seems to be good drainage of the pyloric pouch a gastrojejunostomy at the cardiac portion seems indicated.

The transverse colon cannot be lifted up out of the wound but I can push it upward and to the right thus exposing the upper jejunum which appears normal though relatively of large caliber. The transverse mesocolon toward the splenic flexure is fortunately lax enough to permit a fold of the cardiac pouch of the stomach to be delivered through it but I am unable to get enough slack for the usual technic. However by using these shorter curved clamps and doing the suturing with a curved needle and a needle forceps and working within the abdomen I can get along fairly well. A running suture of silk now being placed posteriorly I incise the stomach and the jejunum and while the intestine has normal mucous membrane enough and to spare the stomach instead of showing a redundancy seems to have a very thin mucous lining. Completing the anastomosis in the usual manner the abdominal wound is ready for suture. Before closing the incision as this patient's body fluids are greatly reduced I will ask the nurse to pour a quart of normal salt solution into the abdomen. It is seldom that I have occasion to resort to this expedient but the response as shown by the character of the pulse is salutary and prompt. I have been watching this patient's condition during the operation very carefully and should have contented myself with a

simple jejunostomy had she not been withstanding the anesthetic or the operation well

This patient will be given nourishment by mouth at the end of the first twenty four hours. Her state of nutrition is so very low that I am afraid of another week of starvation. Liquids by rectum mostly water of course will be continued up to the limit of her capacity to retain them

CONTRIBUTION BY DR. FREDERICK B. MOOREHEAD
AND DR. KAETHE W. DEWEY¹

COMPOSITE ODONTOMA

Summary Clinical aspect of present case—detailed analysis of tumor removed at operation. Composite odontoma a rare lesion—reported cases.

Clinical History—The patient a young man of twenty three, first noticed a numbness in the left lower lip. The numbness was not preceded by pain as is usual in such cases due to pressure on the inferior dental nerve. A swelling slowly developed in the left lower jaw at the angle which increased in size until it was noticeable at a distance. The teeth on that side were lost probably through ordinary alveolar infection.

The swelling was uniform hard and occupied the body of the bone the bulging being equal lingually and buccally. The overlying soft tissues were normal in appearance and a clinical diagnosis of composite odontoma was made from the examination and x-ray. Under novocain nerve block an incision was made over and parallel with the alveolar ridge. On retraction of the soft tissue the bony mass was exposed. The external and internal plates of bone were quite thin and easily removed with a chisel liberating the tumor which was easily lifted from its bed. The fibrous sac described in the report was easily dissected out. The wound was packed with iodoform gauze saturated with compound tincture of benzoin.

Attention is called to the character of this dressing for wounds particularly in the jaws. The ordinary iodoform pack is a foul smelling affair when removed twenty four hours later, but when compound tincture of benzoin is used the dressing remains sweet and free from odor for several days.

¹ Oral Surgery Clinic College of Dentistry University of Illinois

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CONTRIBUTION BY DR. FREDERICK B. MOOREHEAD
AND DR. KAETHE W. DEWEY¹

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Summary Clinical aspect of present case—detailed analysis of tumor removed at operation Composite odontoma a rare lesion—reported cases

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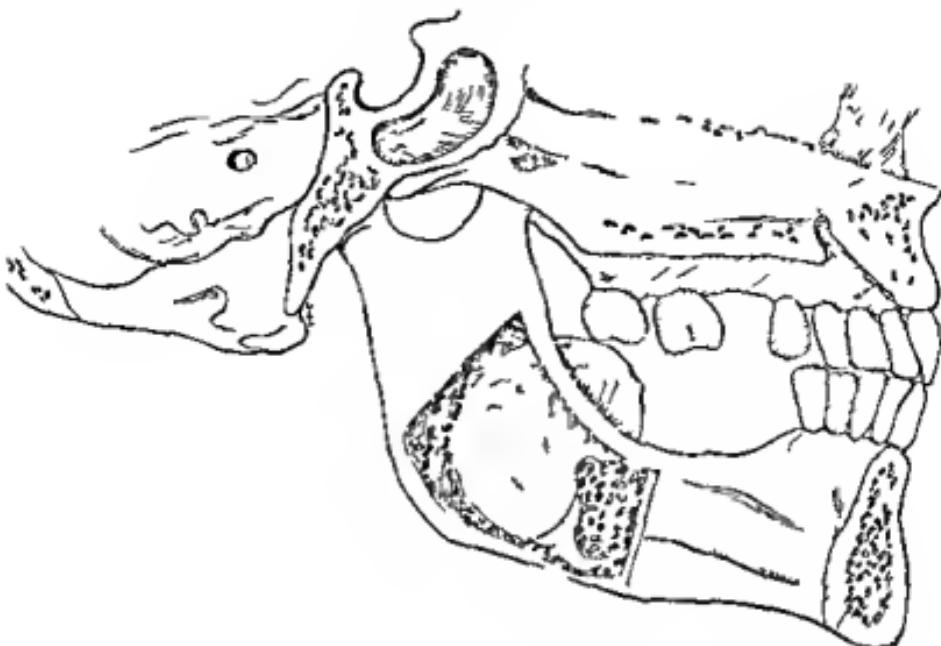


Fig 222.—Drawing from the ray picture showing the tumor as viewed from the inside of the mouth



Fig 223.—Drawing of the tumor natural size showing the position of the molar tooth and nodular elevations on the surface of the tumor composed of enamel. The other surface is almost entirely free from enamel tissue

enamel which is continued over almost the entire concave surface where it assumes the form of stalactitic excrescences. There is an exact negative of the crown of the attached

The cavity entirely filled in with new tissue in four months after the operation leaving no deformity or disability. The inferior dental nerve was divided in removing the fibrous sac. This has since regenerated, restoring sensation to the lower lip.

The tumor as shown in this x-ray picture was kidney-shaped and was placed with the long axis vertically to the jaw, with the concave side directed anteriorly (Fig. 221). The crown of a



Fig. 221. X-Ray picture of the tumor in situ.

molar was placed against the surface of the tumor at its lower extremity only one root was visible the apex of which was curved and directed downward and backward (Fig. 222).

I have here the gross specimen. This tumor measures $3.5 \times 2 \times 2$ cm and weighs 200 gm (Fig. 223). The convex surface is, for the larger part of a dull grayish yellow color, which is dentin tissue the other part viz. about one-third, is covered with a pearly white scaly like layer of



Fig. 226.—Drawing from a frozen section stained with hematoxylin and Sudan III. Lipoid substances (cholesterol mixtures) occur in fine granules in the tissue of pulp chambers (1) in degenerated blood vessels (2) and in dentinal tubules (3) cut transversely and longitudinally. The largest amount is seen in conglomerated masses of dentin and cementum (4) on the left side of the drawing.

a more or less homogeneous material which stains intensely blue with hematoxylin. The border zone of the surrounding tissue is often such deeply staining material. This is dentin supplied with dentinal tubules which often radiate from the spaces, sometimes it is heaped up in irregular conglomerations. There are blood vessels in the compact tissue. The general appearance is that of innumerable small teeth placed closely together. The pulp chambers are disproportionately large (Fig. 225).

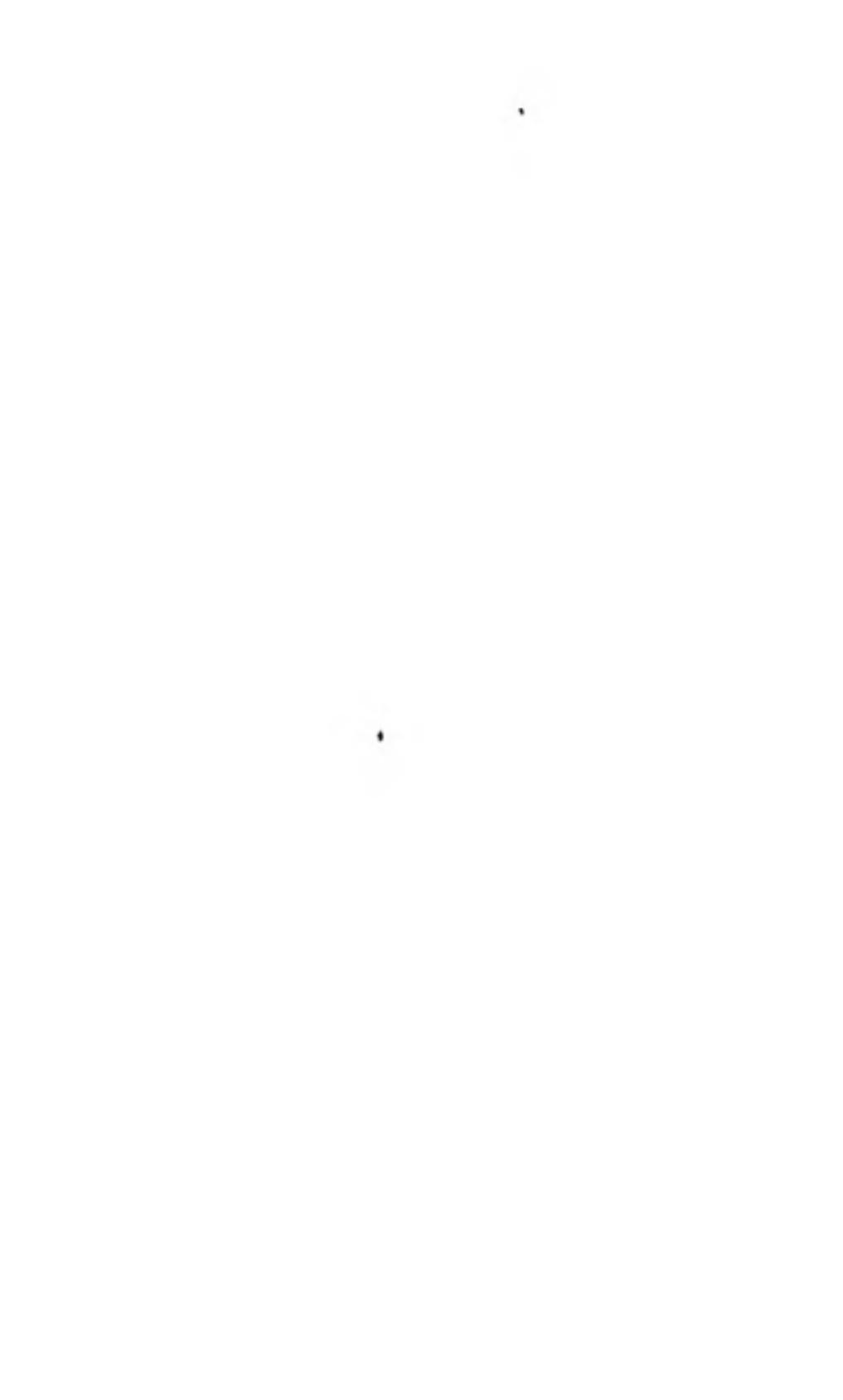
In Sudan III stained sections the lipoids which occur in this tumor have an orange yellow color. There is a considerable amount of this present the pulp tissue shows the most marked degree of lipoid infiltration (Fig. 226). There is practically no neutral fat present. The lipoid substances occur in more or less fine granules staining orange red with Sudan III and purplish with Nde blue. It is very likely that a considerable portion of the lipoid material has been lost in the process of preparing the sections. In many regions the dentinal tubules are filled with a finely granular material. Sometimes a direct connection of the lipoids in the tubules with those in the pulp spaces is plainly visible. Most of the substances are cholesterol esters or mixtures of cholesterol with fatty acids. Very little material is found which is positive with Fischler's method the specific stain for fatty acids and soaps although in sections stained with Nde blue a good deal of the homogeneous material which lies within spaces or at the borders is stained blue indicating the presence of fatty acids.

The thick capsule consists of connective tissue covered on the outside with a thick layer of squamous epithelium which resembles the mucous membrane of the mouth. It is however very much degenerated and in some regions altered beyond recognition in others it is even completely destroyed. Where it is still present in a broad zone it is broken up by proliferating connective tissue papillae and nests which are infiltrated and often completely filled with plasma cells. These cells also replace the destroyed epithelial tissue and densely infiltrate a zone of the subepithelial tissue so that in fact one half of the width

of the membrane consists of a plasmomatous tissue. In addition to the plasma cell infiltration we find an invasion of the squamous epithelium by numerous leukocytes. In some portions of the membrane the connective tissue strands are separated and the spaces filled with blood. There is a marked lipoid deposition and infiltration especially in the regions of the extensive epithelial degeneration and of the plasma cell infiltration. Examination by the polarizing microscope shows these substances to be doubly refractive crystals many show the central cross before heating. Tested by the various staining methods most of them appear to be cholesterol in mixtures with fatty acids. A small amount seems to be cholesterol glycerinesters there is very little of fatty acids and soaps as demonstrated by Fischler's method. It is striking that these lipoids are deposited chiefly in regions where there is marked plasma cell infiltration the plasma cells themselves however are free from cholesterol.

It seems that the first published description of the microscopic structures of a capsule surrounding an odontoma is one made by Hopewell Smith who examined the histology of two odontomas reported by Delamore in 1902. In studying the tissue of the capsule in the region of the attachment to the tumor he found evidence for the supposition he believes that the dental mass of the tumor was developed not only from the odontoblastic cellular layer of the pulp but also from certain cellular elements of the connective tissue capsule. There is nothing in the membrane just described which suggests a similar process in the development of the odontoma which was encapsulated in it. It resembles more the soft tissue which covered the odontoma described by Schumann which likewise consisted of an outer zone of stratified epithelium and a subjacent fibrous tissue the whole structure not unlike the mucosa of the mouth. No degenerative and inflammatory processes however are mentioned by this author the tumor in his case represented an earlier stage of developmental growth in all aspects.

The starting point to the formation of a composite odontoma must of course be in the dental follicle (the term including the sac and contents). Instead of the different structures being



since 1909, which is a rather small number for so long a period

In earlier reports these tumors were described under various names, for example, "excroissances pierreuses, tumeur mamelonnée, dure et comme pierreuse," or simply as evostoses. The term "odontome" as a name for a definite group of tumors of the dental system dates from the work of Broca¹ published in 1869, who thoroughly investigated the cases on record, identified the characteristics common to all these seemingly different structures, and united them into one class. His classical studies have laid the foundation of our present knowledge of odontomas. His classification, however, has been criticised as not being based on histologic facts. The classification made by Bland Sutton, which has a purely anatomic basis, has received a wider recognition. Sutton's definition of an odontoma is that of a

Partsch, Ueber zwei Fälle von Odontomen, *D. Mon. f. Zahnh.*, 1891, 10, 223

Watson, G., A Radicular Odontome, *Jour. Brit. Dental Assoc.*, London, 1894, 15, 667

kein
117

Colyer, J. F., An Unusual Radicular Odontome, *Jour. Brit. Dent. Assoc.*, 1904, 17, 29

abholzen, g. wie vom Zahnsapparat ausgehenden Cysten und soliden Geschwulste der Kiefer, *Erg. de Path.*, 1901, 7, 332

Gilmer, T. L., Odontomes, *Dental Digest*, 1901, 7, 953

Dolamore, W. H., Two Odontomes, *Jour. Brit. Dental Assoc.*, 1902, 23, 539

Martens, Zur Kenntnis der Odontome, *Charité Annalen*, 1903, 27, 288

Sachse, B., Ein Odontom, *D. Monatschr. f. Zahnh.*, 1903, 21, 36

Amoore, J. S., and Gibbs, J. H., *Brit. Dent. Jour.*, 1904, 25, 185

Payne, J. L., A Case of a Composite Odontome, *Jour. Brit. Dental Assoc.*, 1904, 25, 401

¹ Broca, P., *Traité des tumeurs*, Paris, 1869, tome 2, 275

laid down in an orderly fashion there is for some unknown reason an aberration of the process and enamel dentin and cementum are formed without respect to law or order. It is an exalted disorderly formation of tissue.

Nutritional disturbances taking place in the enamel and dentin cells as Krogus has already pointed out must be considered as secondary effects of the pathologic changes in the pulp. Pressure is exerted by the hypertrophic pulp on the tissue forming the enamel and dentin and it sometimes happens that the enamel organ which is less resistant than the dentin atrophies completely, in such cases the fully developed odontoma shows only dentin and no enamel.

The composite odontoma is a rare tumor. General statements in the literature concerning the number of cases on record are somewhat contradictory and probably incorrect. Heath¹ in 1887 compiled all the cases which to his knowledge had been reported since 1809 and enumerated 9 cases including a case which he had observed. According to a later publication by the same author² 11 cases were recorded up to 1894. This list however is not complete. In the compilation by Krogus³ in 1895 some of the cases overlooked by Heath are added and 18 cases in all were collected. In Krogus carefully collected cases some reports have been left out. 5 of these we find mentioned by Sutton⁴. In 1905 Schumann⁵ records 34 cases. A careful survey of the literature⁶ reveals a record of 40 cases.

¹ Heath, C., Lectures on Certain Diseases of the Jaws. *Brit. Med. Jour.*, 1887, 1, 1375.

² *Ibid.* Injuries and Diseases of the Jaws, 1894, 4th ed.

³ Krogus, A. *Ueber die odontoplastischen Odontoma, nebst Mitteilung eines neuen einschlagigen Falles*. *Arch. f. Klin. Chir.* 1895, 15, 275.

⁴ Bland Sutton, J. *Tumors, Innocent and Malignant* 1893, p. 31.

⁵ Schumann, E. *Ueber einen Fall von Odontom am Unterkiefer nebst einer Uebersicht über die vom Zahnsystem ausgehenden Kiefergeschwüste*, I. D., Leipzig 1905.

⁶ Billroth, Th. *Ueber die Struktur pathologisch neugebildeter Zahnsubstanzen*. *Arch. f. Klin. Chir.* 1855, 8, 426.

Black, G. V., *Report to the Illinois State Dental Soc.* 1879 quoted from Gilmer.

Dunkerly, J. W., *Odontomes*, *Brit. Jour. Dental Science* London 1892.

only decisive factor 'The only etiologic factor which we know is age,' Krogius writes. Odontomas, of course, cannot arise after the development of the teeth is complete and in fact the majority of the odontomas have been observed in young adults. There are a few exceptions. Salter¹ reported an odontoma in a man of thirty five years. Rupture of this tumor through the gingiva occurred, later a similar growth developed in the same place. Arkovy² reported an odontoma in a man thirty five years old. The largest odontoma known is one observed by Hilton³ in a man aged thirty six years. Such exceptions, however, do not contradict the rule. In Salter's case the tumor arose in connection with a supernumerary tooth, Arkovy's is not quite clear on this point, in Hilton's case the odontoma occurred in the antrum. These exceptions probably all refer to odontomas which originated from aberrant anlage and not from developmental disturbances of the normal tooth germ.

Spontaneous expulsion of the tumor occurred in a case reported by Harrison, which Heath has mentioned, also in the cases of Hilton and Rushton Parker.⁴ With a few exceptions the tumors were located in the lower jaw. Some of the cases in older reports and those described by Andrew and Colyer are odontomes in the upper jaw. Lloyd⁵ described a tumor in the maxilla in a man of twenty one years, who gave the history of a blow on the right upper jaw some time previous to the symptoms. Most of the odontomas showed the impression of a retained tooth. In Salter's case the patient had a full complement of teeth. The size of these tumors should exceed that of a tooth, according to Baume. Two were as large as a hen's egg. The largest composite odontoma known is that observed by Hilton in a man of

¹ Salter J. *Contribut on to Dental Pathology* Guy's Hospital Reports 1858 4 279

² Arkovy J. *Ueber ein Odontom Oesterr Ung Viertelj f Zahnheil* 1887 1 6 quoted by Krogius

³ Described by Bland Sutton *loc cit*

⁴ Rushton Parker *Odontoma of the Second Lower Left Molar Tooth* Tr Path Soc London 1881 32 240

⁵ Lloyd J. *Composite Odontome of the Upper Jaw Removal* The Lancet 1858 1 64

"tumor composed of dental tissues in varying proportions and different degrees of development arising from teeth germs or teeth still in the process of growth." As such it may be, first a soft or calcified epithelial tumor, derived from the enamel second, an aberration of the tooth follicle and develop into a follicular cyst or a fibrous odontoma, third, an aberration of the papilla, and be called a radicular odontoma or a dentoma or an osteodentoma, fourth, an aberration of the whole tooth germ and be called a composite odontoma because it is composed of all the tissues of the tooth germ. From the standpoint of such an embryopathic and odontopathic basis all these tumors are odontomas, it is customary, however, to apply this name only to the fourth group, namely, to hard tumors of the jaw which are composed of fully developed enamel and dentin. These tumors are composite, according to Sutton, not only in that they "originate from all the elements of the tooth germ but they are composite in another sense, many of these tumors are composed of two or more tooth germs indiscriminately fused. But they differ from the cementomata containing two or more teeth in the fact that the various parts of the teeth composing the mass are indistinguishably mixed whereas the individual teeth implicated in a cementoma can be clearly defined." Baume¹ also separates the odontoma and counts to the latter only those odontopathic malformations which develop into growths exceeding the size of a tooth. He divides the real odontomas into coronary or crown-odontomas and radicular or root-odontomas.

While some types of the odontomas are not infrequently observed in animal, especially in the herbivora, composite odontomas have been found only in man.

Although the origin of these anomalies is evident, namely, some disturbances in the development of the tooth germ we do not know anything concerning the cause of such disturbances. Trauma does not seem to play a part. There are a few cases on record in which there was a history of some external violence, and even in these it is not absolutely clear that trauma was the

¹ Baume, R., *Lehrbuch der Zahnheilkunde*, Leipzig, p. 155.

CLINIC OF DR. GOLDER L. McWHORTER

PRESBYTERIAN HOSPITAL

SURGICAL TREATMENT OF EMPYEMA

Summary Developments in the treatment of empyema during the past year demonstration of a case treated by intercostal siphon drainage

DURING the past year the treatment of empyema has undergone various changes. This is due to the fact that early rib resection brought poor results, especially in the virulent empyemas due to the streptococcus associated with toxic pneumonia. Results of experimental and clinical research along this line have shown indications for different methods of treatment, and also that each case must be carefully considered before deciding the method to be used. The method of irrigating empyema cavities has been reintroduced, but with the added use of the chlorin solutions.

Methods to avoid an open pneumothorax have been used for years by a number of men. Buelau,¹ one of the first to advocate this method, introduced a large catheter through a trocar, which was then withdrawn. Negative pressure was produced by the siphon action of a long rubber tube filled with pus. At that time Schede stated that the mild cases could be treated in this manner, but the serious ones should have a resection. Perthes² resected a rib and inserted a rubber tube with a broad collar which was made air tight by covering with petrolatum and stretching tight against the chest. For negative pressure he used a water pump with a manometer attachment, others used the gravity siphon water-bottles. Many modifications of these methods have been made. Valve action drains without any suction have been used.

thirty six years and diagnosed as an exostosis. The tumor weighed nearly 15 ounces and measured 27.5 cm in its greatest circumference. The second largest tumor, observed by Duka,¹ weighed 1060 grains, and measured nearly 3 inches in its widest diameter. Denticles or conglomerations of teeth are sometimes reported as composite odontomas but are not recognized by such authorities as Colyer, Schmidt, etc., as belonging to the class of composite odontomas. An unusual case of this type was observed by Hildebrand,² where 150 to 200 individual teeth were counted and Goebel³ quotes a case of a conglomeration of teeth the number of which was estimated at several thousand.

The predominating substance in composite odontomas is dentin. Enamel is not constantly present, it may be entirely lacking. Also the presence of cementum is inconstant. Sometimes bony substances are found. Krogius believes that such osseous tissue is not to be considered as equal to real cementum but that it results from a fibrous transformation and subsequent ossification of the pulp. The presence of a connective tissue capsule is mentioned only in a very few cases.

¹ Duka A Case of Removal of a Part of Superior Maxillary Bone on Account of a Bony Tumor in the Nasal Fossa Tr. Path. Soc. London 1866 17 256

² Hildebrand C H Beitrag zur Lehre von den durch abnorme Zahnentwicklung bedingten Kiefer-tumoren D. Ztschr f. Chir. 1890 31 282 Ib d 1893 35 804

³ Loc. cit.

and visceral pleura, allowing the lung to expand. The pleural cavity is closed tight after the lung is expanded by means of the positive gas oxygen pressure, except for small drains at the ends of the incision. Lilienthal¹³ reports a series of 100 cases where this was done. He reports very few chronic cases and a fairly low mortality.

Recently Graham and Bell¹⁴ have emphasized the dangers of creating a large open pneumothorax during pneumonia. They have shown that with a normal mediastinum the normal thorax may be regarded as one cavity instead of two. Any change of pressure in one pleural cavity is accompanied by practically an equal change in the other, so that an equilibrium exists at all times throughout the whole thorax. If the mediastinum is rigid or fixed by adhesions, then a pleural opening on one side will not produce the same pressure changes in both pleural cavities. When the amount of air taken into the lungs is limited by the presence of pneumonia and there is an excessive demand for air, with a weakening of the muscles of respiration which aid compensation, the size of a pleural opening compatible with life becomes smaller. Under critical conditions even a small open thoracotomy wound may produce death from asphyxia.

DEMONSTRATION OF CASE

The patient, J. S. No. 122,612 entered the hospital February 23, 1919, on the medical service of Dr. J. B. Herrick. He had been sick three days with fever, headache, backache, and a bad cough. On examination, there was impaired resonance over the bases of both lungs and a high fever. A diagnosis of influenza with bronchopneumonia was made. On February 27th he had very marked pain in the left side and coughed a great deal. On March 2d he was very weak and seriously ill. On March 3d there were evidences of consolidation of the whole left lower lobe and one patch in the right lower lobe posteriorly. Patient in serious condition. On March 4th complained of severe pains in left chest which were worse when lying on the left side. Condition about the same. On March 10th a thoracentesis of left side was done, but no fluid was obtained. On March 12th

In reviewing the recent reports there seems almost a general disapproval of wide open thoracotomy in cases with toxic pneumonias or in virulent streptococcus empyemas. Substitution of this treatment by repeated aspiration until the fluid has become creamy and the pneumonia improved has given better results, with a late open thoracotomy^{4, 5, 6, 8}. One recent report from Camp Donphan is an exception. The writers conclude that the best results in all types of empyema follow immediate operation with rib resection and drainage.

Aspiration in some cases has been followed by cure without drainage^{4, 5, 10}. This has, perhaps, led to the use of intermittent or continuous aspiration by means of a permanent rubber tube through a small intercostal opening^{4, 5, 10, 11}.

The chlorin antiseptics or formalin and glycerin^{4, 5, 6} have been used in conjunction with these methods of treatment. Stoney¹² and many others place great reliance upon Dakin's solution. Stoney allows the external wound to heal and reports patients discharged apparently healed, with a pneumothorax. He states that in these cases it is unnecessary to obliterate the cavity by distention of the lung or by a chest wall plastic.

Whittemore¹³ uses a catheter drain with a siphon suction only in cases critically ill. He uses a long tube for the siphon action and keeps the end of the catheter under water. He performs the Libenthal operation primarily on all cases not desperately sick. Homan¹⁴ recommends rib resection as the original operation. He does the Libenthal operation only in cases where the lower lobe is not adherent far out on the diaphragm but near the midline and is unable to expand and fill out the cavity. He shows that where the lung surface is concave it will balloon out and fill the cavity, but where the lower lobe is adherent near the midline and where the surface is convex, as shown by the Roentgen ray, the conditions are unfavorable for expansion and a Libenthal operation should be done early.

The Libenthal operation consists of a long intercostal incision followed by spreading the ribs widely apart and the removal of the fluid pus and the fibrin layer covering the costal

creased negative pressure over the siphon action of the tube was obtained by means of two large gravity siphon water bottles. The drainage bottle was arranged air tight and a vacuum maintained by the suction from the siphon water bottles, changing them as the water ran out. This suction method was maintained for several days until the patient was able to sit up for a short

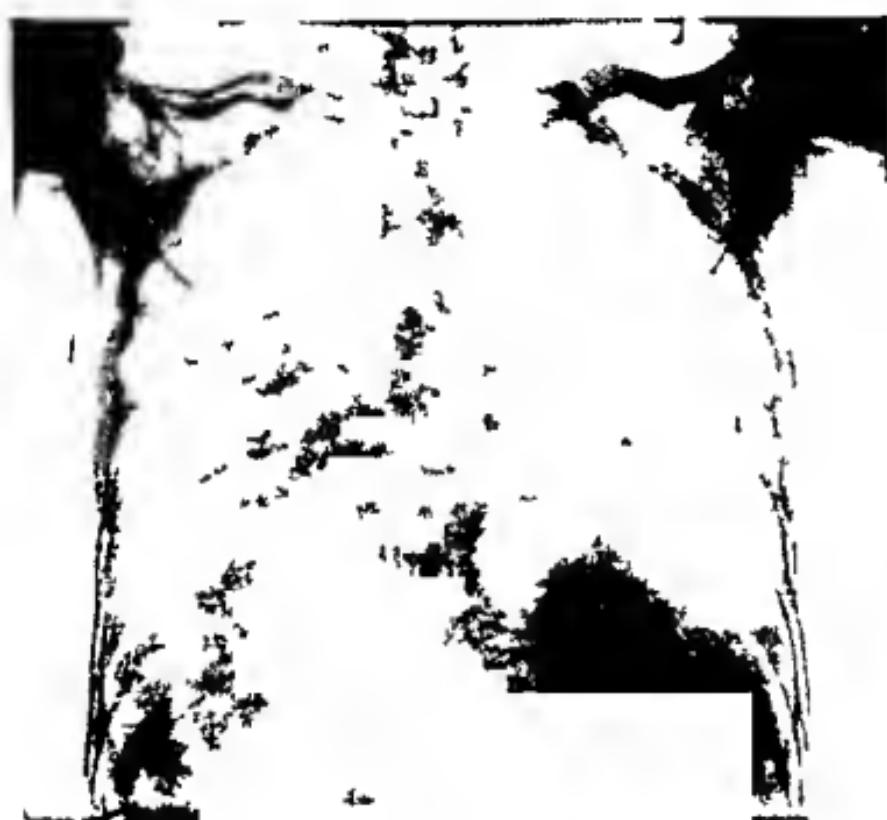


Fig. 227. Face as before operation. Evidence of fluid pneumonia and displacement of viscera.

time in a wheel chair on the sixth day when it was discontinued. The patient was instructed in light graduated exercises and to use the bottles by blowing the water from one to the other. He was able to walk around on the twelfth day. The temperature following operation dropped from 101.6° F. to normal in twenty four hours. The 8 P.M. temperature during convales-

purulent fluid was obtained from the left side, 5 c.c. being removed

The heart was displaced to the right. There was dulness 8 cm to the right, with an impulse beat in the right midclavicular line.

The temperature for the first twelve days in the hospital varied from 104° to 102° F., and it touched normal for the first time on the fourteenth day. Then it gradually increased until when he was operated for empyema it was 101.6° F.

Urine on February 24th showed albumin present, a few white blood-cells, no casts. A twenty four hour specimen showed no albumin, and was negative throughout.

Blood examination on February 24th showed hemoglobin 68 per cent, 6100 white cells.

Blood pressure on February 24th was 110 systolic and 64 diastolic. On March 7th the hemoglobin was 72 per cent and white count 21,400.

On March 8th five days before operation stereoscopic plates (Fig. 227) gave evidence of fluid in the left chest. There were evidences of pneumonia present.

He was transferred to my service on March 13th. Operation under local anesthesia. A small needle was first put in and pus aspirated, then a short incision with the soft parts pulled up to aid valve formation was made in the eighth interspace in the scapular line. The point of the knife was introduced through the wall very cautiously, hugging the upper border of the rib. A small grooved director was introduced along the knife which was withdrawn. A stilet was put into a No. 18 French catheter with two extra fenestra near the end. This catheter was then pushed through the small incision directed and maintained by the grooved director until the end had entered the empyema about 5 or 6 cm. The tube was aspirated and pus obtained. It was temporarily clamped and fastened firmly with adhesive strips over a small pad of gauze.

The patient was returned to his bed and a long tube connected with the catheter and the end placed in a large bottle on the floor. Pus began to drain immediately. On the third day in

full of normal salt solution and aspirating with a syringe. However, it may be necessary to change the tube. Where there is a persistence of symptoms the aspirating needle should be used to locate pus pockets.

The valve formation of the skin and muscle around the small opening will tend to prevent pneumothorax with the aid of a



Fig. 228.—Eight days after drainage of empyema. Some thickness of pleura. Rubber tube intercostal drain still in place.

small pressure pad over the wound. After adhesions form these precautions are not necessary. Increased negative pressure by some mechanism after gradual drainage of the pus is of considerable value especially for a few days. Blow bottles and early exercises assist in expanding the lung. The drainage tube must not be removed too early but replaced by smaller drains.

ence rose to 99° F. a few times, but at no time did the temperature go higher. The drainage was accurately measured each day until the tube was removed.

	cc.		cc.
March 14	8.0	March 28	4.5
15	2.5	26	8.0
16	12.0	27	3.0
17	12.0	28	0
18	4.5	29	4.0
19	1.5	30	1.5
20	7.0	31	1.5
21	10.5	April 1	1.5
22	6.0	2	1.0
23	8.0	3	0.6
24	7.0		

On April 4th the tube was removed and a small collapsible tube of rubber-dam inserted. A dressing was placed over the end of the rubber drain. April 7th drain was changed. A small amount of stringy mucoid discharge from the rubber drain. Smears and cultures taken. Only a few organisms to the field. A pure culture of pneumococcus present.

Weight on March 24th was 113 pounds and on April 7th was 123 pounds.

On measurement of the amount of expansion of the two sides of the chest there is at this time 1 inch less on the affected side. The heart beat and dulness have returned gradually to nearly normal. Stereoscopic Roentgen plates were taken eighteen days after operation (Fig. 228). The heart has returned to a practically normal position. There is some evidence of a thickened pleura otherwise practically negative. On April 9th no discharge and the drain was removed. On April 11th twenty-nine days after operation the wound practically closed and the patient was discharged with instructions to report every two days. On April 14th wound healed.

This method of drainage through an intercostal incision just large enough to insert the tube allows for adequate drainage provided it is not plugged with fibrin or thickened pus. Inspiration will then usually clear the tube or it may be cleared by injecting it.

- 13 Whitemore The Surgical Treatment of Empyema Boston Med and Surg Jour 178 360 March 1918
- 14 Homan The Prognosis and Treatment of Empyema Ann of Surg 67 697 June 1918
- 15 Lilenthal Empyema of the Thorax Ann of Surg 66 290 1917
- 16 Graham and Bell Open Pneumothorax Amer Jour Med Sci 156 839 December 1918
- 17 Capps and Lewis Blood pressure Lowering Reflexes from Irrigation of the Chest in Empyema Tr Assoc Am Phys Philadelphia 22 188 1908

Intercostal drainage is often impossible in old cases due to the close approximation of the ribs with partial collapse of the chest wall. In these cases or in secondary operations rib resection is usually necessary.

Irrigation of the cavity and even aspiration of the fluid may produce collapse or death probably due to the pleural vago-sympathetic reflex.¹⁷ The value of Dakin's solution other than its antiseptic action is in the proteolytic dissolving action on the fibrin coating of the lung which prevents its expansion and on the clots which may plug the drainage-tube. No irrigation was done in this case.

This simple closed thoracotomy has definite advantages especially so in a selected number of serious cases requiring a wider range of safety than that provided under the open pneumothorax method. Constant watching of the drainage-tube and asepsis for the prevention of secondary infection are necessary.

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- 15 Lilenthal Empyema of the Thorax Ann of Surg 66 290 1917
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- 17 Capps and Lewis Blood pressure Lowering Reflexes from Irrigation of the Chest in Empyema Tr Assoc Am Phys Philadelphia 22 188 1908

CLINIC OF DR ALBERT E HALSTEAD

ST LUKE'S HOSPITAL

DIVERTICULA OF THE ESOPHAGUS

Summary Varieties and pathologic anatomy of diverticula of the esophagus—etiology—symptoms and diagnosis—the x ray—the proper use of sounds and stomach tubes—the method of Jung treatment usually surgical—Dr Halstead's two stage operation

GENTLEMEN The patient I wish to present to you today is Mr G W age thirty nine white American married, no children—wife now pregnant and at term. He complains of (1) inability to swallow food both liquid and solid. He first experienced difficulty in swallowing about twelve years ago. During the last three years he has become much worse. At the present time he can take liquid food only when in the recumbent position with the head and shoulders lower than the body. In the early stage of his disability he noticed that granular foods seeds rice etc were swallowed with more difficulty than soft solid foods and liquids. (2) Regurgitation of food after taking a small quantity. The first food taken seems to lodge just below the line of the upper border of the sternum. Regurgitation of both food and water has been noted for about two years. During the last three months it has been most troublesome. Of late only small quantities of liquid food can be taken at a time. (3) Loss of weight. He has lost weight steadily for three years. He believes he has lost 18 pounds in the last three months.

There is no history of pain during the act of swallowing or after. After taking food the neck feels full. This feeling is referred mostly to the left side just above the upper end of the clavicle. Upon compression of the neck food may be made to regurgitate into the mouth. When this is accomplished the

feeling of fulness and the slight dyspnea associated with this fulness disappear.

Family history is negative.



Fig. 229.—Diverticulum of esophagus. x Ray of patient after swallowing bismuth mixture. The diverticulum is distended so that its position and form can be easily determined.

Personal history is negative. Had the common diseases of childhood. Denies venereal disease.

Habits good. Does not use drugs or alcoholic drinks.

Smokes moderately. There is no history of ingestion of corrosive liquids, none of injury to the neck.

Physical examination shows a rather pale, emaciated, middle-aged man. Has the appearance of having some wasting disease. Skin sallow. No scars or marks apparent. Muscles weak and flabby. Bones and joints negative.

Head, negative.

Neck, negative, except after ingestion of food or water, when there appears a swelling to the left of the median line just above the sternoclavicular articulation. This disappears on pressure or when upon making an effort to vomit, the food previously taken is forced back into the mouth.

On passing an esophageal bougie it can be introduced to a depth of 9 inches, when its progress is arrested. At no time since he has been on this service could we introduce either a bougie or stomach tube into the stomach. The point of arrest was always the same, about 9 inches from the incisor teeth.

Bismuth swallowed was shown by the x ray to pass into a pouch, the orifice of which was just behind the cricoid cartilage. The sac when filled reached to a point $\frac{1}{2}$ inch below the level of the sternal notch and occupied a position somewhat to the left of the median line of the neck (Fig. 229).

Chest, negative.

Abdomen negative.

From the above history and from our findings upon physical examination we must conclude that the obstruction that we find is due to a diverticulum of the esophagus.

For convenience of description there may be included under the head of diverticula of the esophagus:

A. Pressure or pulsion diverticula.

1. Those of the pharynx.
2. Those of the pharyngo-esophageal junction, the borderline cases or the *Grenz diverticula* of Rosenthal, also known as Zenker's diverticula.
3. Diverticula having their origin near the bifurcation of the trachea just above the left bronchus. These are the epibronchial diverticula of Leutgert.

4 Deep-seated diverticula, mostly found near the esophageal opening in the diaphragm. These are also called epiphrenic. The orifice is generally a short distance above the diaphragm, the fundus of the sac resting upon it.

B Traction diverticula

C Traction pulsion diverticula

Diverticula of the first group are found in the lateral pharyngeal wall. They are mostly congenital in origin. They frequently are in the beginning remains of the third and fourth branchial clefts, starting as incomplete branchial fistula, that have from pressure from within gradually assumed the shape and characteristics of a pressure diverticulum. They may also originate in a congenital pouch like recess found on the posterior pharyngeal wall, similar to the pharyngeal pouches found in certain animals, such as the pig, camel and elephant.

Congenital strictures of the upper end of the esophagus may have an important bearing upon the development of any of these pharyngeal diverticula.

Trauma causing a weakening or rupture of the pharyngeal wall, may also be the cause of diverticula. Cases are reported where foreign bodies, lacerating the pharynx, have been the essential cause in the development of pharyngeal diverticula.

Excessive pressure upon the pharyngeal wall from long continued blowing in wind instruments may, in case of congenital defect or when the pharyngeal wall has been weakened by disease or trauma, be an important factor in the development of diverticula. In these cases a pouch of mucous membrane is forced between the fibers of the muscular wall of the pharynx, later retention of food with the ever increasing pressure from within may result in a typical pressure diverticulum.

The second group, the pharyngo-esophageal pulsion or pressure diverticula although not most common are the most important both from a clinical and pathologic standpoint.

They develop exclusively in the median line posteriorly. At times from traction as the sac grows larger and is compressed against the vertebral wall it is displaced to one side usually

the left the fundus of the sac being in relation to the lateral wall of the esophagus. In the course of development of the pouch the esophagus is also displaced so that the axis of the pharynx and the orifice of the diverticulum are in a line permitting easy entrance of food into the sac and obstructing the lumen of the esophagus. Their point of origin corresponds to a triangular space just below the inferior constrictor where by separation of the longitudinal muscular bands of the esophagus and an absence of the circular muscular fibers there is normally a defect in the musculature of the esophagus. This weak point is known as the Lanier Hackermann point (Fig. 230 1). It is here that a hernia of the mucosa takes place with the greatest ease. On a level with this point the esophagus is narrowed and is fixed in front by its relation to the cartilaginous larynx so that any increase in pressure from within must unequally distend the posterior wall (Fig. 230 2). In case of arrest of an unusually large bolus of food or of a foreign body it is this weak point that bears the impact.

The picture of a typical diverticulum of this group is that of a sharply defined protrusion of a portion of the wall of the esophagus. The size varies from a pea to that of a large pear. They are pear shaped or cylindric with an orifice considerably smaller than the circumference of the sac. The larger ones have a thick wall resembling the wall of the esophagus. In the smaller ones the walls are thin and transparent. In none do we find a complete muscular layer. The sac is made up of mucous membrane covered by a layer of connective tissue. Near the neck may be found a few bundles of muscular tissue drawn from the inferior constrictor.

In structure this group differs from those of the pharynx which may have a complete muscular layer and from those of the lower end of the esophagus in which no muscular tissue is found around the neck of the pouch. The mucous membrane rarely ulcerates or becomes actively inflamed. Carcinoma or papillomatous degeneration rarely occurs.

3. Diverticula having their orifice just above the level of the left bronchus are occasionally found. These are etiologically

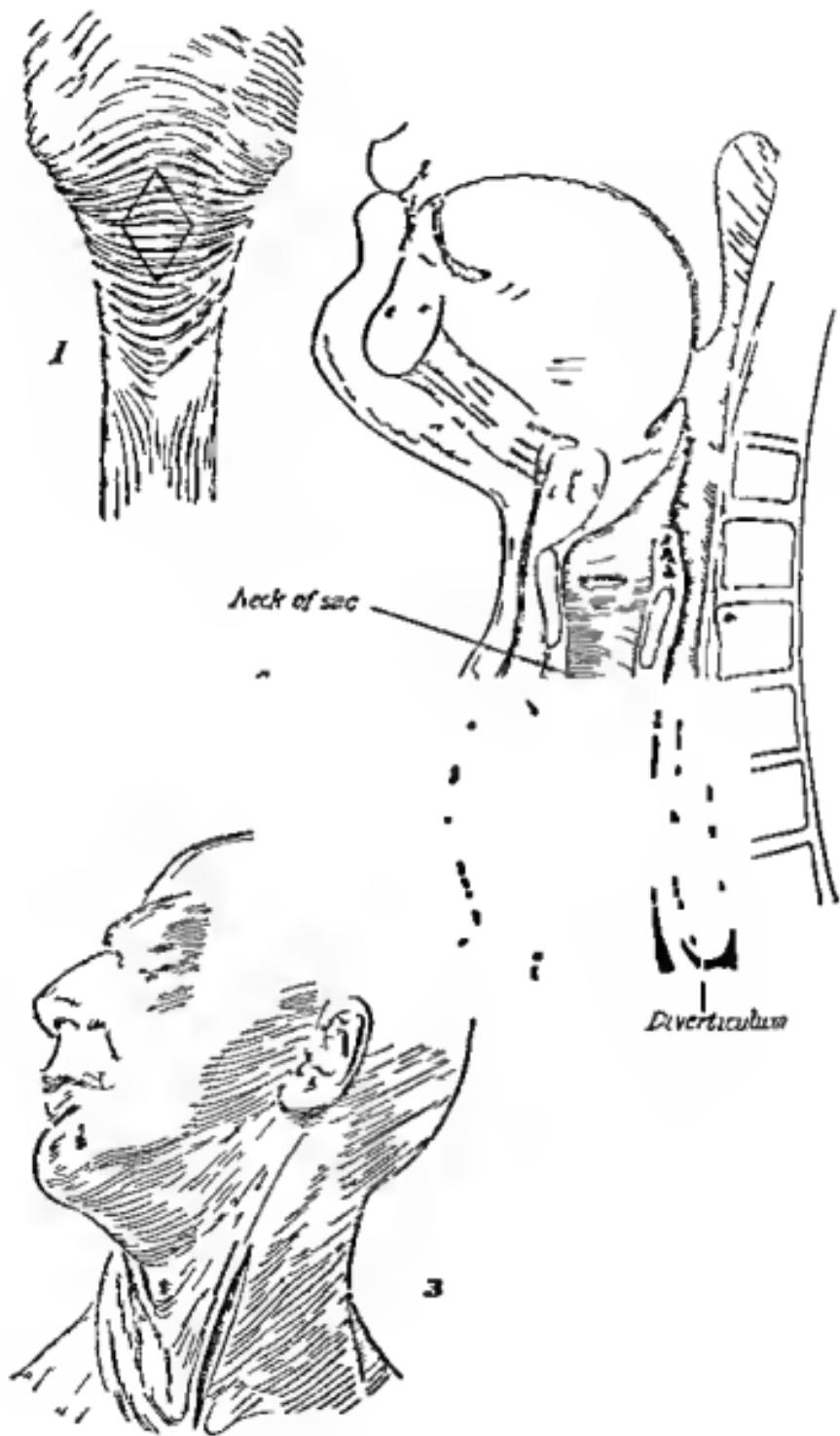


Fig. 230

distinct from Zenker's diverticula. At this point there is a distinct fossa, caused by the relation of the left bronchus to the esophagus. This fossa is known as the epibronchial fossa of Leutgert. The presence of this fossa determines the origin of pressure diverticula as well as constituting an important etiologic factor in the causation of carcinoma of this portion of the esophagus.

The fossa of Leutgert, due to a pushing in of the anterior esophageal wall by the left bronchus, varies in size in different individuals. At times it is deep enough to contain the terminal phalanx of the finger. In others it is a mere dimple. The fossa when deep gradually increases in size until, by arresting food, it becomes sacculated and assumes the shape and characteristics of a diverticulum.

4. The epiphrenic diverticula belong to the traction pulsion group. They have been found mostly on the anterior and lateral walls of the esophagus. Inflammatory bands connecting them with the mediastinal glands show them to have been originally traction diverticula. They have seldom been recognized during life. Occasionally they appear to be primarily pulsion diverticula. This opinion is based upon those cases reported where no fibrous tissue or degenerated glands have been found in near proximity.

B. Traction diverticula, as the name suggests, have their origin in a pouch like process of the esophagus, which by traction through an inflammatory band has been drawn into the neighboring connective tissue. These are much more common than those due to pressure, but are of slight clinical significance.

They are small, occur in the anterior wall of the esophagus, and generally have their orifice directed downward. They seldom produce symptoms during life and are mostly of interest to the pathologist. Infection of bronchial or mediastinal glands, with the consequent inflammation spreading to the esoph-

Fig. 230.—Diverticulum of esophagus. 1. Weak spot in posterior wall of esophagus. 2. Sagittal section showing relation of diverticulum to the esophagus, trachea and larynx. 3. Incision for exposure of diverticulum.

agus, with subsequent contraction of the inflammatory band connecting the gland with the esophagus explains their origin.

Occasionally by the lodging of sharp foreign bodies they become a menace to life. Cases are reported where perforation by a foreign body has caused a fatal mediastinitis. Others have reported sudden death through penetration of the pulmonary artery by a sharp foreign body lodged in a traction diverticulum.

C Traction pulsion diverticula are those traction diverticula which by retaining food become pressure diverticula. They have, in the beginning the same location and characteristics as traction diverticulum. When by pressure they become enlarged they constitute an important though relatively uncommon group.

Symptoms.—The first symptoms that attract attention are those of a gradually increasing stenosis of the esophagus in ability to swallow at first granular food, such as rice beans etc. In many this difficulty in swallowing dates from early childhood. Here we may assume that a *congenital* narrowing of the esophagus may both explain the symptoms of obstruction and also be an etiologic factor in causing the diverticulum.

As the sac grows larger more and more food is collected and retained, sometimes for several days. As the walls of the sac contain no muscular fibers spontaneous emptying except during the act of vomiting is impossible. Fermentation takes place. When the diverticulum attains a certain size pressure from the distended sac occludes the esophagus so that any food taken after the sac is filled regurgitates into the mouth or is expelled from the mouth. Regurgitation with subsequent chewing and swallowing gives the clinical picture of rumination. In certain cases where the diverticulum is of moderate size, after the sac becomes filled at the beginning of the meal the orifice is so displaced by traction of the filled sac that it is no longer in a direct line with the pharynx. In these cases food taken after the sac is filled passes directly into the stomach without hindrance.

In nearly all cases as the sac grows the lower border of the orifice forms a valve like projection into the lumen of the

esophagus and closes it completely after the diverticulum is filled. As the orifice is directed upward swallowing of solids and liquids may be accomplished by taking food while the body is reclining with the head and neck down. The ability to take food while in this position only is one of the most characteristic signs of diverticulum.

Pain after eating usually is present when the diverticulum has reached a sufficient size to obstruct the esophagus by pressure. This pain is relieved by emptying the sac either through the act of vomiting or by pressure upon it. The pain is generally referred to the root of the neck or is retrosternal. Colicky epigastric distress after taking food has been noted. This symptom is common both to diverticula of large size and to cardiospasm.

In large diverticula a swelling of the neck or a circumscribed tumor may be seen after eating. Lateral pressure with the fingers made behind the trachea will generally empty the sac and cause the tumor to disappear. When this can be accomplished food ingested several days before may be expelled.

Diagnosis of diverticulum of the esophagus is based mostly upon the clinical history, the subjective symptoms above mentioned and upon the evidence obtained by the use of the sound. The sialograph may be employed with positive results by filling the sac with bismuth mixture (Fig. 229) or by introducing a metallic sound or rubber tube filled with shot. By this means the depth and position of the sac may be ascertained which is of importance in deciding upon the advisability of an operation. In a diverticulum high up in the esophagus and in diverticula of the pharynx the use of the esophagoscope gives positive findings. In the deep seated diverticula its value in making a diagnosis is slight. Transillumination has also been employed but with limited success. In the sound we have a means of examination if properly employed that will permit of a nearly certain diagnosis. In many cases upon attempting to pass a moderate sized or small sound we find it meets with an obstruction which first appears to occlude the esophagus completely. Often in changing the position of the patient as

by throwing the head far back or to one side, the obstruction is easily overcome, and the sound passes into the stomach un hindered. In other cases, as in one of ours, we may not be able to pass a small or moderate-sized sound, while a large sized sound will easily slip through. In still another class of cases at certain times all sizes may be passed with ease while at other times neither large nor small sounds can be introduced.

Rumpel has made use of two stomach tubes to differentiate between diverticulum and dilatation. This method, as improved by Jung, offers the best means, when carefully employed of recognizing diverticula, particularly those of the lower end of the esophagus. Rumpel employed two tubes—one, with numerous perforations in its lower end is passed directly into the stomach, the other, with but a single opening at the end into the esophagus above the cardia. Water, if poured through the second tube, will run down into the stomach through the opening in the first in case of dilatation. If a diverticulum exists it will first be filled, and if the overflow will reach the stomach, the contents of the diverticulum can be returned to the second tube and measured.

The chief obstacle to this procedure is the introduction of the first tube into the stomach. In some cases of diverticula this is impossible, and in extreme cases of dilatation it is frequently difficult. Jung employs two tubes in the same manner as Rumpel. In addition, he introduces a third smaller tube with only two perforations at the end, through the first or stomach tube. By this means he is able to aspirate the fluid from the stomach which gives positive information as to the position of the tube. With Rumpel's perforated tubes alone no fluid can be withdrawn from the stomach thus making it impossible to ascertain definitely if the stomach has been entered. By allowing clear water to pass into the stomach through the first tube and a colored solution through the second and by having the water returned unmixed with the colored solution from the inner or third tube, a positive diagnosis of diverticulum can be made, and dilatation of the esophagus with or without cardiac spasm can be excluded.

In non malignant stricture of the esophagus, if a sound be passed into the strictured zone, no mobility of the sound is possible, while in a diverticulum, if the sound be passed into the sac, although it cannot be pushed farther down, a considerable degree of lateral mobility is possible. This procedure is sufficient to differentiate simple stricture from diverticula.

Treatment.—Palliative treatment consists in the use of daily lavage of the sac, astringent injections are indicated only in cases where the diverticulum is inaccessibile or when for any other reason an operation is contraindicated. In a case that has been under my observation from time to time for twenty four years the patient has learned how to empty the sac and to cleanse it by lavage daily. In this instance although the sac is very large after it is filled it does not completely obstruct the esophagus. The patient, an intelligent man, manages to keep in fairly good health. Every night before retiring he empties the sac and flushes it out through a small stomach tube. He has always refused an operation.

The rational treatment of all pulsion diverticula at the pharyngo-esophageal juncture is essentially surgical.

Two methods of dealing with the sac have been employed.

1. Invagination of the sac into the esophagus and closure of the inverted orifice by purse string suture—the method of Girard. This method should only be used when the sac is small—not larger than the terminal phalanx of the thumb.

2. Isolation of the sac and excision with closure of the wound in the esophagus by suture.

This operation is best performed in two sittings, as first practised by me. At the first the sac is exposed through an incision parallel to the anterior border of the sternomastoid extending from the upper level of the larynx to the sternoclavicular articulation (Fig. 230, 3). By dull dissection the esophagus is reached. The only structures of importance that need be divided are the external jugular vein, the middle thyroid veins and the superior thyroid artery and vein. The thyroid body is displaced inward, while the neck of the sac is sought for at the level of the cricoid cartilage. Identification of the sac is facilitated

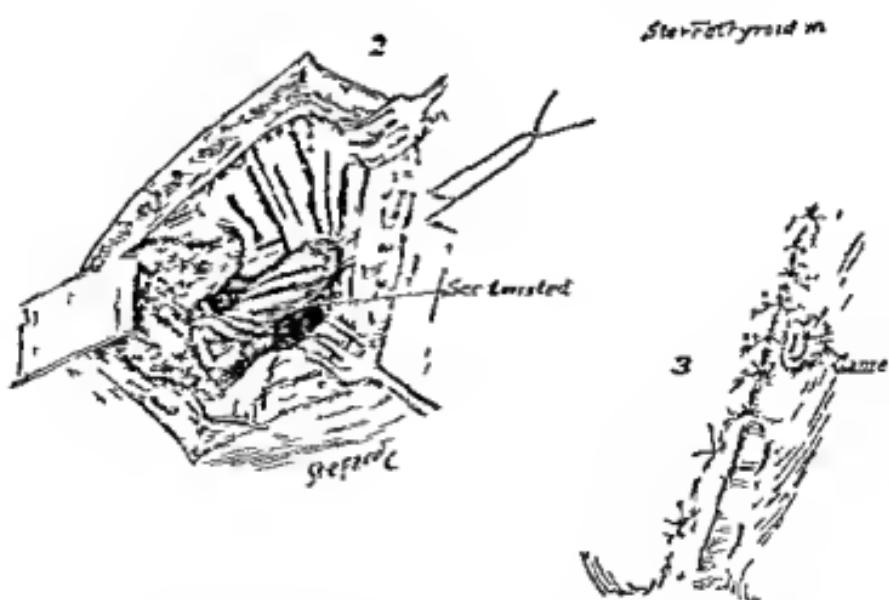


Fig. 231.—Diverticulum of esophagus. First stage of operation.
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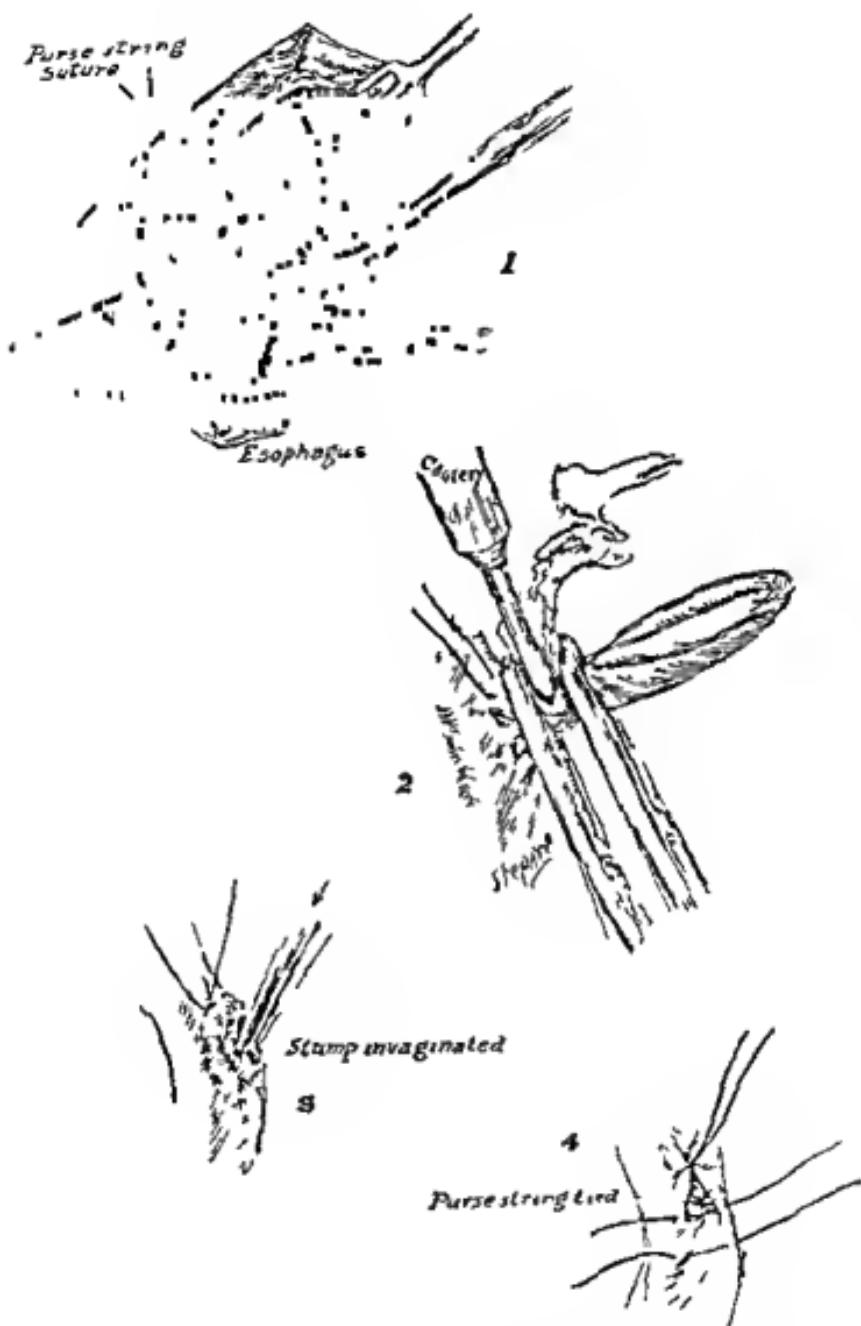


Fig. 232.—Diverticulum of esophagus. Second stage of operation

by introducing an esophageal bougie into the sac (Fig. 231, 1). The sac is separated from the loose connective tissue of the

prevertebral space through dull dissection. This is generally easy of accomplishment. It is then drawn out into the wound, twisted on its transverse axis, and fixed by suture to the skin at the upper angle of the wound (Fig. 231, 2). The bed of the sac is packed with gauze. The skin, except at the point where the sac is fastened, is closed by suture (Fig. 231, 3). After four or five days the gauze packing is removed.

After this step the patient may be fed without any difficulty. No obstruction to swallowing will be experienced.

After one week, or ten days we perform the *second step*. The wound is reopened, the sac is grasped and the granulating edges of the wound separated until the neck is exposed. Around the neck a purse-string suture of Pagenstecher linen or chromicized catgut is passed, but not tied (Fig. 232, 1). The neck is clamped between two forceps and cut through between the forceps with a cautery knife (Fig. 232, 2). The forceps next to the esophagus are removed and the neck invaginated and the purse-string suture tied (Fig. 232, 3). This act is much like the common method of treating the stump of an appendix. The purse string suture is reinforced by two or three interrupted sutures placed through the muscular wall of the esophagus (Fig. 232, 4). A gauze drain is placed down to the point of suture and the wound closed.

The advantages of this method are apparent. The high mortality that has followed excision of diverticula has been largely due to infection from the opened esophagus, of the loose connective tissue of the prevertebral space and the posterior mediastinum. When the esophagus is opened after this space is closed off by granulations the danger from infection is practically eliminated. In case a fistula does develop through cutting through of the sutures, it is a comparatively unimportant event. Closure within two or three weeks at most may be expected.

CLINIC OF DR KARL A MEYER AND
DR W F MONCREIFF

COOK COUNTY HOSPITAL

VOLVULUS

Summary Tuberculosis of the peritoneum with tubercles mesentericus and chronic mesenteritis producing volvulus of the ileum. Relative frequency of volvulus of the sigmoid and of volvulus of the small bowel—types of volvulus. Pathogenesis—spontaneous restitution—clinical picture—treatment.

History—P. S., a male Austrian, age thirty two, entered the surgical services of Dr. D. N. Eisendrath with a diagnosis of intestinal obstruction. He complained at that time of severe colicky pain in the abdomen, nausea and vomiting, and inability to have a bowel movement. For a period of several months preceding there had been considerable weakness, loss of weight, night sweats, and a daily afternoon rise in temperature. The present attack started four days previous to admission to the hospital. The first symptom was pain, beginning abruptly in the left lower quadrant, constantly present, with colicky exacerbations. After several hours the pain gradually became diffuse over the abdomen and remained so. Vomiting began later on the day of onset, and thereafter occurred several times a day, with expulsion of large quantities of watery vomitus of non-offensive odor. There has not been a normal bowel movement since the onset.

During the past six months the patient has had night sweats, afternoon fever, marked weakness, and has lost 25 pounds in weight in spite of sanitarium treatment for tuberculosis during that time.

Habits, family, and personal history were negative.

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after four days of obstruction, the prognosis is necessarily grave. We shall combat the shock and toxemia as vigorously as possible by external heat, pushing fluids by proctoclysis, hypo-



Fig. 233.—Volvulus. Loop of gangrenous bowel as unfolded at operation. Note how the pedicle of the mass is formed of intestine wrapped around the twisted root of an elongated section of the mesentery.

dermoclysis and intravenously with epinephrin together with pituitrin and other stimulation.

Postoperative Course. The patient survived a very stormy period of four days following the operation and improved

Physical Findings—Patient entered the ward in a condition of severe shock. The facial expression was anxious and drawn, skin cold and clammy with perspiration. The pulse was rapid, weak, and thready, respiration rapid and shallow, and temperature subnormal. Examination of the head and neck revealed no other significant findings. Evidence of recent active tuberculosis was found in the chest. There was generalized rigidity and extreme distention of the entire abdomen most marked in the left lower quadrant. Tenderness was general, but more acute on the left side of the abdomen. Shifting dulness was present in the flank. There were no other physical findings of any special significance.

The laboratory findings were negative.

Diagnosis—The clinical picture is evidently one of ileus. With the evidence of pulmonary tuberculosis it seems probable that we may also find a fibrous tubercular peritonitis, with an obstruction of the bowel probably due to adhesions.

Operation—We open the abdomen through a midline incision below the umbilicus. As the peritoneum is incised, a bloody fluid escapes. The peritoneal surfaces which come into view are thickly studded with miliary tubercles, and the peritoneum is definitely edematous. Presenting in the left lower quadrant you can see a mass of greatly distended bowel of a dark gray to black color which is dull and lusterless in appearance. As we unfold this mass you observe that we have about 6 feet of gangrenous ileum twisted on its mesenteric axis (Fig. 233). The root of the mesentery of this loop is markedly narrowed by thick scar tissue, and just above its vertebral attachment is a large mass of caseous lymph nodes (tuberculosis mesentericus), which produces a relative shortening of the mesentery of the next loop of the ileum. There is complete thrombosis of the vessels in this twisted mesentery. I shall proceed to resect this gangrenous bowel and do an end to-end anastomosis by the usual technic. Especial care is necessary in packing off the field to avoid soiling the peritoneal cavity with the extremely toxic bowel content. We close the abdomen in the usual manner, without drainage. The patient is toxic and in severe shock.

The rotation of a loop of bowel about its mesenteric axis, which is the most usual type of volvulus, can only occur when the loop in question is very long, with a correspondingly long mesentery, or when there is marked narrowing of the mesentery at its root with approximation of the ends of the loop, forming a pedicle. Both of these anatomic conditions may coexist. In vegetarian races particularly the Russian peasants, as stated by Kuttner, the intestinal tract is much elongated and volvulus is of more frequent occurrence among these people than the other Continental races. Elongation of parts of the mesentery and its loop of bowel may be congenital or acquired. Volvulus occurs nearly always in adults over forty years of age, which indicates that the anatomic conditions mentioned are probably acquired much more often than congenital. Chronic constipation produces this acquired change, especially in the mesosigmoid, which is dragged upon and stretched by a heavy, atomic, sigmoid loop, distended by feces and flatus. The length of the bowel itself undergoes a permanent increase because of the chronic state of distention, and the ends of the flexure are approximated at the root of its mesentery. Acute distention with consequent lengthening of the intestine, as seen in peritonitis or other causes of paralytic ileus, or distention from mechanical obstruction of other types, produces a condition favoring volvulus in the same way by disturbing the relation between the length of a loop and its fixed points of attachment.

Changes of this type in the ileum are often produced by incarceration or strangulation of a loop in an external hernia, with permanent narrowing of the mesentery at the ends of the loop.

Cicatricial contraction of the mesentery, with narrowing at its root, produced by chronic peritonitis or mesenteritis, without change in length of bowel or mesentery, is an infrequent predisposing cause of volvulus. Our patient furnishes an instance of this condition.

We often find volvulus where a portion of the bowel is fixed to the abdominal wall by adhesions. In these instances the volvulus is usually secondary and situated above the primary obstruction at the site of the adhesions.

slowly thereafter, being able to leave the hospital on the forty-second day, to continue sanitarium treatment for tuberculosis.

This is an instance of the serous type of tuberculosis of the peritoneum, without adhesions between loops of bowel or between bowel and parietal peritoneum. The cicatrical contraction of the mesentery near its root, as met with at operation, is obviously a sequel of the chronic tuberculous process, and is of significance. By approximating the end of the bowel loop a pedicle has been formed, which became twisted. There is no marked elongation of the bowel or its mesentery.

A volvulus of the small bowel about its mesenteric axis, independently of adhesions, bands, or hernia through intestinal apertures, is of very infrequent occurrence. Treves in 1883 was able to find only 10 recorded instances of this sort, in 7 of which the volvulus was in the lower ileum. In 2 of these cases there were recurrent attacks of partial obstruction at varying intervals before the fatal acute obstruction. These occurrences suggest that when the amount of rotation is less than 180 degrees, and the obstruction only partial, temporary relief may occur spontaneously, with the probability that the same cause, unless corrected, will again produce torsion of the bowel. If this is the case there must be certain factors responsible for maintaining a volvulus once it has taken place a phase of the question which we shall presently discuss.

According to Nicholas Senn Leibtenstein in an analysis of a series of 1541 cases of intestinal obstruction of all types found 76 instances of volvulus, 45 of which occurred in the sigmoid flexure, 23 in the ileum and 8 in the jejunum-ileum. Volvulus, in this large series of cases has produced 5 per cent approximately of all the obstructions. Most authorities ascribe a higher percentage of obstructions to volvulus perhaps because in obstructions by bands, adhesions, kinks, strangulation through apertures, and similar mechanical obstructions, volvulus is a frequent concomitant finding in the small bowel particularly. As to the regions of the bowel in which volvulus is commonest the sigmoid flexure is, according to most authorities involved in at least 60 to 80 per cent of cases.

ourselves with the other types of volvulus further than to mention them in passing. Rotation of the bowel about its own axis occurs very rarely, and then only in the cecum or colon. Various types of knotting of loops of bowel, or rotation of one loop about another as an axis, are not common by any means as independent causes of obstruction, and the factors involved are very similar to those we have discussed.

Clinically, volvulus may present acute, subacute, or chronic symptoms, according to the degree and location of the obstruction. Rotation of 180 degrees or more will produce complete obstruction, with strangulation and acute symptoms. As in all forms of obstruction the severity and urgency of symptoms increase as the location of the lesion approaches the oral end of the alimentary tract. I wish to emphasize those features of the clinical picture in volvulus which are to some extent characteristic of this type of obstruction. Vomiting is, in general a less prominent feature than it is in other types of intestinal obstruction. In volvulus of the small bowel vomiting usually begins early but is likely to occur at relatively long intervals and in large quantities. When the lesion affects the sigmoid flexure vomiting often begins late is usually not severe, and in a few cases has been entirely absent, but eructations are frequent. Tenesmus is often present in volvulus of the sigmoid and may be severe. Pain is the first symptom practically always, and, though well marked, often lacks extreme severity. Distention of the abdomen is extreme and usually develops rapidly. Early in the course it may be localized to the lower portion of the abdomen or one of the lower quadrants.

Volvulus with partial obstruction gives rise to subacute or chronic manifestations, characterized by recurrent attacks with mild obstructive symptoms, which continue until in some attack a complete obstruction occurs with acute symptoms.

The necessity for early laparotomy in all varieties of intestinal obstruction applies with equal force to volvulus. Senn advocates evacuation of the bowel contents by incision when extreme and general distention is present, followed by irrigation

The exciting causes of volvulus include exaggerated peristalsis, irregular peristalsis, and unequal distribution of intestinal contents. Posture is sometimes a factor in producing a twist, where a localized collection of material has weighted a short segment of bowel the remainder of the same loop being empty or nearly so. These causes are practically incapable of producing volvulus, especially persistent volvulus in the absence of predisposing factors, which has been demonstrated by Henning who ligated at different levels the intestines of animals and distended the proximal portion with water. Elongated loops of small bowel tended to rotate, but in the large bowel, where the mesocolon was short, rupture occurred in advance of any tendency to produce volvulus.

Two cases of volvulus associated with the passage of large gall-stones through the small bowel have been reported by Mayo-Robson, the volvulus being attributed to excessive peristalsis. These occurrences are somewhat analogous to the volvulus produced above a partial obstruction of the bowel due to organic stricture by means of excessive peristalsis in a distended elongated loop. With a bowel and mesentery normal as to length and attachments, there is a strong tendency to spontaneous reposition of loops twisted on the mesenteric axis, as shown by Senn, who rotated loops of bowel in animals and sutured them in position. Sufficient yielding of sutures and adhesions always occurred to prevent obstruction.

On the other hand, when the rotated bowel and its mesentery

* * * * *

with further obstruction to the circulation. Distention of the loop and the counterpressure exerted by the abdominal wall maintains the twisted position. Intra abdominal pressure is further increased by distention of the bowel above the obstruction, which is often an additional obstacle to any possible spontaneous replacement.

For the purposes of this discussion we need not concern

CLINIC OF DR. ALBERT J. OCHSNER

AUGUSTANA HOSPITAL

UMBILICAL HERNIA

Summary A patient presenting cervical polyps and an incarcerated umbilical hernia removal of polyps with cautery technic of the Mayo operation for umbilical hernia—exact method of inserting sutures

THE patient is a married woman, sixty six years of age. She has a swelling at the navel which has been present for years. She has a good deal of pain over the navel if she does not take cathartics. Her past history is negative. She has some edema of the lower extremities.

The general physical examination is negative. There is a mass the size of a large orange in the region of the umbilicus, no other masses or areas of tenderness, no rigidity. There are two masses the size of walnuts pedunculated attached to the cervix uteri at the external os.

These two polypi are removed from the cervix one from the anterior lip and one from the posterior each $2\frac{1}{2}$ x 2 cm in diameter and attached to a pedicle $\frac{1}{2}$ cm in diameter and 3 cm long. The pedicle of each polyp is grasped by means of a clamp including the mucous membrane of the cervix at the point of attachment. The clamps are tightly closed and then the pedicle is separated by means of the electric cautery care being taken to thoroughly char the portions grasped by the forceps in order to seal the blood vessels contained (Fig 234). In this manner the hemorrhage will be prevented without the necessity of applying a ligature or suture. When the eschar becomes separated the mucous membrane will be healed smoothly so that no defect will remain.

In the case of pedunculated intra uterine polyps the same method is employed the forceps being passed up into the cervix

of the lumen and suture of the bowel wall. He also emphasizes the importance of eviscerating the rotated loop before attempting to disengage the twisted portion, and of shortening the affected mesentery by a fold or tuck properly anchored by sutures in order to forestall recurrence.

nia containing omentum and possibly a small portion of the transverse colon judging from the fact that the patient has been suffering from intestinal stasis (Fig 235 1)

In operating upon these umbilical hernias we invariably follow the method which was introduced by Dr W J Mayo which consists in making an elliptic incision of the skin over lying the hernia with its greater length extending from side to side in this manner the sac and its contents are exposed. If you approach the operation in an unsystematic way cutting a little here and a little there you can easily waste an hour or more before you have the whole sac removed and in the mean time you may injure the intestine or the omentum that is contained in the hernial sac but on the other hand if you proceed systematically picking up one edge of the sac and here open the peritoneum and then go step by step along the edge of the sac it will take but a few minutes and the entire operation is completed so far as removal of the sac is concerned.

You see this abdomen is long from above downward and short from side to side. That is the principle we make use of in this operation. We make an elliptic transverse incision and then perform the Mayo operation. The difference between the Mayo operation and the one introduced by Joseph Blake lies in the fact that the former makes his union from above downward and Blake overlaps and sutures the edges of the wound from side to side. He does not take advantage of the fact that these cases have too much length from above downward and too little length from side to side and consequently after the operation in which he makes the incision from above downward the patient is uncomfortable because the tissues are constantly on tension and because the tissues which are already shortened have become more shortened by the steps of the operation because they overlap from side to side. On the other hand by making a transverse closure and overlapping the edges so that the upper edge lies underneath the lower one or vice versa you take advantage of the conditions found and in that way the tissues are not on tension and the patient is perfectly comfortable and can sit up in bed directly after the operation has been

of the uterus, grasping the pedicle in the same manner. The narrow blade of the electric cautery is passed up into the cervix



Fig. 214.—Removal of cervical polyp with clamp and cautery.

of the uterus for the purpose of severing the pedicle the opposite side of the uterine canal being protected by means of a spatula

INCARCERATED UMBILICAL HERNIA

The mass in the region of the umbilicus in this case is stationary. Pressure has no effect upon the size or shape of this mass, which moves freely with the abdominal wall but cannot be moved independently. It is an incarcerated umbilical her-



Fig. 236—3, Incision into the sac exposing contents. 4, The sac is cut off at neck, while the fingers of the left hand protect the sac contents.



Tom Jones

Fig. 232.—1 Hernia at umbilicus. 1 Line of incision. 2 The hernial sac dissected free to its junction with parietal peritoneum.



Fig. 236.—3, Incision into the sac exposing contents. 4, The sac is cut off at neck, while the fingers of the left hand protect the sac contents.

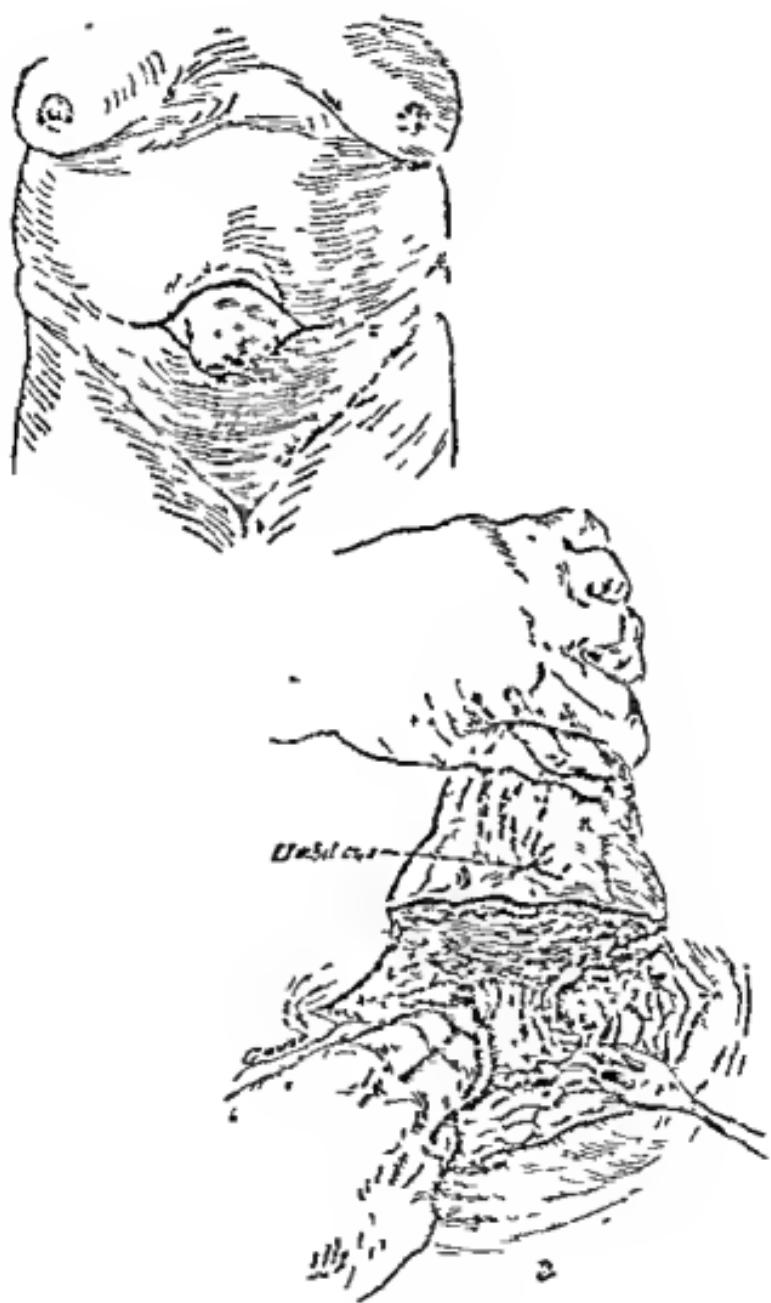
*Tom Oches*

Fig. 235.—1, Hernia at umbilicus. Line of incision. 2, The hernial sac dissected free to its junction with parietal peritoneum.

completed without any danger of causing tension upon the wound. We urge these patients to sit up at once, because they are usually fat, and, consequently, the possibility of a hypostatic pneumonia is increased if they are permitted to lie in bed in the horizontal position after the operation.

You see how carefully I dissect down to the aponeurosis, exposing the sac with its contents (Fig. 235, 2). The sac is 15 cm wide from side to side, 12 cm from above downward, and 8 cm vertically. We have opened one little point here where the sac joined the abdominal wall, and you see that the former contains omentum. The assistant places his finger in the opening. Then I cut the peritoneum and transversalis fascia composing the hernial sac step by step. Ordinarily this can be accomplished most conveniently by placing a sharp-toothed retractor in the edge of the abdominal wound and having this held tense by the assistant, while the left hand of the operator makes traction upon the hernial sac together with its contents. This will catch the edge of the neck of the sac at the point at which it joins the abdominal wall conveniently exposing it to be cut by means of a sharp scissors or scalpel. The entire process of cutting the neck of the sac in its complete circumference requires but a few moments (Fig. 236, 3 and 4). Then the finger is inserted between the sac wall and the contents of the sac at the most convenient point and the sac is split in a vertical direction. In this manner it is possible to dissect the contents of the hernial sac without the slightest danger. Aside from the omentum the sac contains a small piece of fat which is also removed. In order to replace this omentum I must enlarge this hernial incision. The omentum is retained in the hernial sac by means of several strands, all of which are

Fig. 237—5 The sac everted showing adhesions of omentum and jejunum which are being severed and ligated. 6 The upper flap of peritoneum and omentum.

upper flap and returning along the same route. Stitches A and B have been tied thus pulling the upper flap beneath the lower.

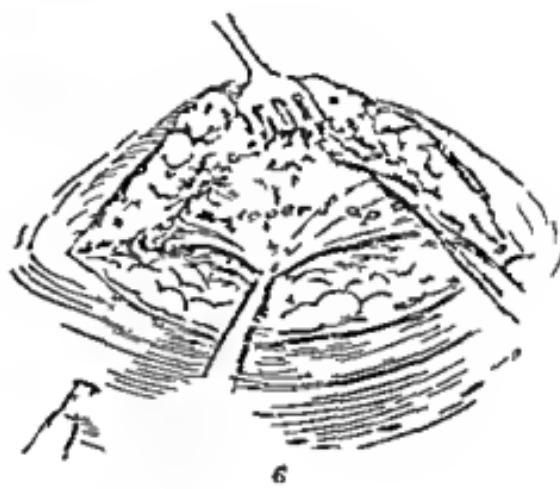


FIG. 23*i*

caught in the forceps, cut, and ligated (Fig 237, 5) It takes but a few minutes to ligate the omentum and dispose of the sac Now this step is completed, and I shall examine the gall bladder, because a large proportion of these cases have gall stones She does not happen to have any The uterus is in the normal position She has a small, normal appendix Consequently, nothing further needs to be done

I now proceed to close this wound In order to close it so that it will stay closed permanently we make sure that we have the flap properly arranged I examine the flap above and find there is a lot of fatty tissue upon its under surface, and consequently it would be better to slide our flap from above downward I examine the lower flap on the inside and find that it is composed throughout of solid, hard tissue, so that we can be sure to have a good solid attachment there and will have no return of the hernia I am shaving away every bit of fat and loose connective tissue from the upper surface of the upper flap so that nothing may interfere with its becoming attached to the lower surface of the lower flap We are now prepared to suture our flaps We do this in the following manner We first provide a number of little incisions in the skin, 5 cm from the edge of the skin wound and $2\frac{1}{2}$ cm apart (Fig 237, 6) I make five of these incisions We then pass a needle through these openings and through the entire thickness of the abdominal wall pick up the edge of the upper flap and then return with the suture to the point from which we started (Fig 237, 6) We repeat this with each successive suture We apply this suture with very great care We prefer to use chromicized catgut sutures which will last at least thirty days for this purpose In this way we secure an accurate coaptation between the lower edge of the upper flap and the peritoneum

12 The skin sutured with horsehair

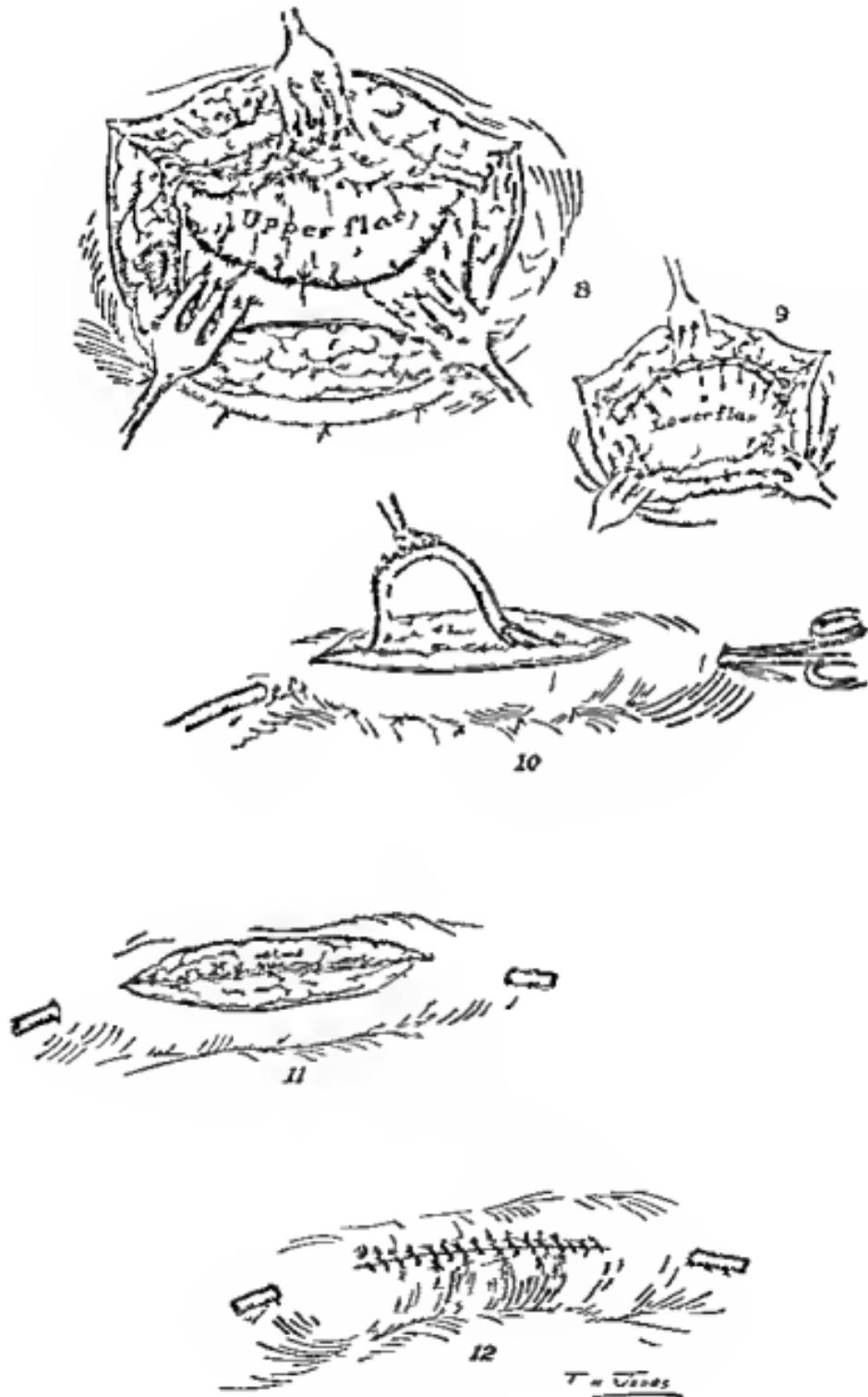


Fig. 238

INTESTINAL FISTULA

Summary A cecal fistula following suppurative appendicitis—deterioration of abdominal wall by the escaping intestinal juices—treatment by feeding egg-albumen technic of repair of fistula after treatment

History—The patient, a boy of nine years was admitted to the hospital February 13, 1919. The mother states that three months ago the child had a ruptured appendix following influenza. Appendix was removed at this time but the wound never healed. It has been dressed every day since. Sometimes bowels move through rectum, but usually from fistula in abdomen.

Past History—Had influenza two months ago, otherwise negative.

Family History—Negative.

Examination shows an anemic undernourished individual, a child nine years of age, who presents himself on account of a fistula following a pus appendix. General examination is negative. Abdomen is of the flat type. There is an opening in the abdomen on the right side opposite the umbilicus discharging feces. No masses, nodules, areas of tenderness or rigidity are to be found.

When this patient came into the hospital three weeks ago an area 10 cm. in diameter of the skin of the abdomen surrounding this intestinal fistula consisted of a mass of red granulations. The skin had apparently all been eaten away. This fistula permitted the escape of pancreatic juices which ran over the edge of the wound. We see that frequently in duodenal fistula and also in case of drainage of the common bile duct, where there is a large amount of pancreatic juice coming out through the wound. You will find sometimes that the entire abdomen is just one raw mass of granulations and the suffering in these cases is so intense that the patient can hardly bear it. A good many years ago we found that by putting these patients altogether on a diet of egg albumen—that is, the whites of two eggs

and transversalis of the lower flap from 5 to 7 cm from the upper edge of the lower flap, the amount of overlapping secured in this way depending upon the looseness of the abdominal wall. The greater the overlapping the more satisfactory will be the closure of the hernial opening. In order to ensure absolutely accurate coaptation we insert a sharp retractor underneath the upper edge of the lower flap the reinforcement and suturing of which has just been accomplished, and place interrupted sutures of fine chromicized catgut between the sutures that have already been tied, ensuring a perfect coaptation between the lower edge of the upper flap and the posterior surface of the lower flap (Fig. 238, 8) The lower flap is now swung up over the upper and accurately sutured in place by means of interrupted chromicized catgut sutures (Fig. 238, 9) In this way we are sure there will be no weakening and no recurrence. There is

catgut sutures in position to hold these flaps of fat together, but here we are even more careful than elsewhere not to use any pressure in tying the sutures (Fig. 238, 11) We simply bring the surfaces together, just enough to hold them. The circulation in this fatty tissue is slight, and so we must be careful of trauma. If we should draw these sutures too tightly we would be sure to produce trauma and wound healing would be retarded.

These hernias may protrude directly through the umbilical opening or they may protrude above or below the opening. In this case the hernia came out at a point a little above the umbilical opening. At the umbilical ring a very slight sac extended directly into the umbilical opening producing an additional, and, in this instance, a true umbilical hernia. This was clamped, ligated, and removed before undertaking the closure of the major opening.

four times a day—within three days the surface will be healed. The egg albumen takes up all of the irritating material and within three days the entire irritation will have subsided. Of course, in this child we could not give an egg albumen diet constantly, but we had to give him other things at intervals of two or three days, but still you see this enormous area is perfectly healed. The child had an appendectomy performed about three months ago and the fistula was the sequel.

We will first make an incision around the fistula so as to secure a portion of skin that has not been infected (Fig 239, 1). Now we will take some sutures and cover over this entire surface so that there can be no leakage during the operation. This step of the operation takes only a few moments and it gives you a feeling of security. Now that we have this intestinal fistula closed, we will proceed with the operation (Fig 239, 2). Our next step must be to make an incision without disturbing the first one we made. The fistula is on the anterior surface of the cecum, almost exactly opposite the point of entrance of the appendix into the cecum. All that is left of the appendix is a small portion $1\frac{1}{2}$ cm in length, comprising the distal portion of the original appendix, the remainder of the appendix and a portion of the anterior wall of the lower end of the cecum having sloughed away entirely at the time of the acute attack. The fistula resulting from the defect in the cecum was left after the slough had come away.

It is always best to enter the peritoneal cavity a little above or a little below the point at which the intestine containing the fistula is attached to the anterior abdominal wall in order not to injure this portion of the intestine. We can then pass a finger around the intestine within the abdominal wall and can carefully sever the adhesions between these two structures with

Fig 239.—Intestinal fistula. 1. Fistula with line of incision. 2. Fistula dissected free from abdominal wall and closed with sutures to prevent escape of contents. 3. Cecum ileum and fistula brought out through abdominal

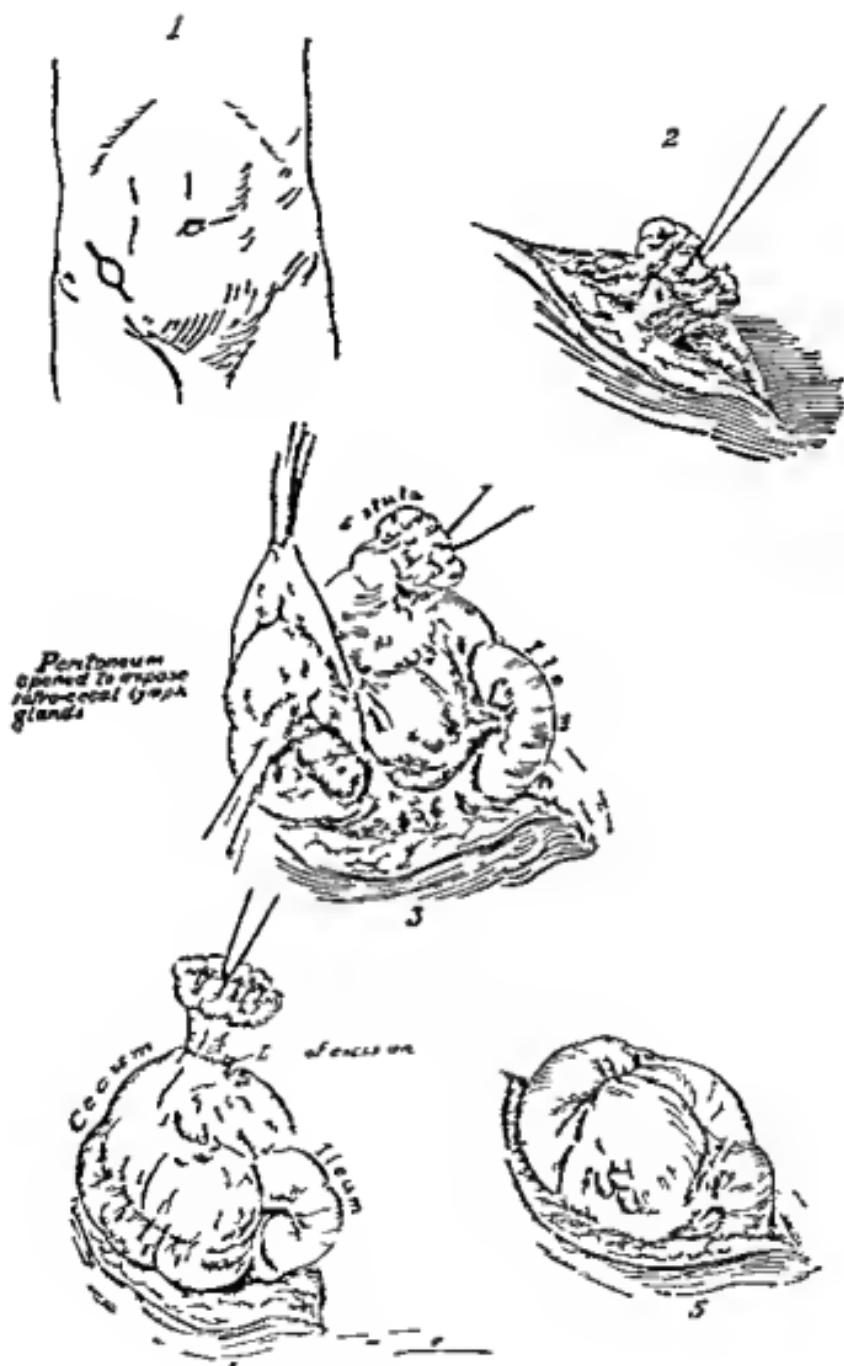


Fig. 259

four times a day—within three days the surface will be healed. The egg-albumen takes up all of the irritating material and within three days the entire irritation will have subsided. Of course, in this child we could not give an egg albumen diet constantly, but we had to give him other things at intervals of two or three days but still you see this enormous area is perfectly healed. The child had an appendectomy performed about three months ago and the fistula was the sequel.

We will first make an incision around the fistula so as to secure a portion of skin that has not been infected (Fig 239, 1). Now we will take some sutures and cover over this entire surface so that there can be no leakage during the operation. This step of the operation takes only a few moments, and it gives you a feeling of security. Now that we have this intestinal fistula closed, we will proceed with the operation (Fig 239, 2). Our next step must be to make an incision without disturbing the first one we made. The fistula is on the anterior surface of the cecum, almost exactly opposite the point of entrance of the appendix into the cecum. All that is left of the appendix is a small portion $1\frac{1}{2}$ cm in length comprising the distal portion of the original appendix, the remainder of the appendix and a portion of the anterior wall of the lower end of the cecum having sloughed away entirely at the time of the acute attack. The fistula resulting from the defect in the cecum was left after the slough had come away.

It is always best to enter the peritoneal cavity a little above or a little below the point at which the intestine containing the fistula is attached to the anterior abdominal wall in order not to injure this portion of the intestine. We can then pass a finger around the intestine within the abdominal wall and can carefully sever the adhesions between these two structures with

out causing any injury to either. Having exposed the cecum we lift it out of the abdominal wound being very careful through out the steps of the operation to sponge away any intestinal contents which may be forced out as a result of the manipulation. There is here a mass of enlarged retrocecal lymph-glands which I shall remove. They are easily exposed by an incision lateral to the cecum, and shell out very readily (Fig. 239, 3). I will close this incision without drainage. We are now ready to deal with the fistulous tract which we have exposed. I sever it at its junction with the cecum (Fig. 239, 4), remove the tissues thus released, and then place a few fine silk interrupted sutures through the edge of the wound in the intestine in order to adjust the edges in the direction in which healing seems most likely to occur without causing any constriction or obstruction. The edges of the intestinal wound having been adjusted, we place one fine silk interrupted suture 1 cm beyond each end of the intestinal wound and these sutures are held taut and left in place until the operation has been completed in order that no portion of the intestinal opening may be overlooked. The second row of interrupted silk sutures is then applied about 1 cm apart. These sutures include the serous layer and the muscularis and submucous connective tissue but they do not penetrate the lumen of the intestine stopping short on the outer surface of the mucous membrane. The whole line of sutures is again inspected and if any slight defect is discovered this is overcome by the insertion of one or more fine interrupted silk sutures. We have been careful to avoid soiling of the wound or the peritoneum with intestinal contents since it is not likely to be aseptic at as low a point as this in the intestine. By following this systematic plan of suturing we can be absolutely sure that after it has been completed there can be no defect and no leakage (Fig. 239, 5). The sutures have been placed with just sufficient firmness to secure accurate coaptation of the edges of the intestine and not with sufficient force to cause pressure necrosis. Unless the intestine containing the fistula like the one before us is entirely freed from its attachments to the abdominal wall one does not usually succeed in obtaining permanent closure of the

defect. On the other hand the operation which has just been demonstrated in this case practically always results in a complete and permanent closure.

After treatment—The patient's intestines having been thoroughly emptied before operation by the administration of 2 ounces of castor oil the day preceding the operation there is no chance of gaseous distention or fermentation and consequently the patient is likely to be very comfortable after this operation and unless food is given by mouth there is neither any likelihood of postoperative gaseous distention nor of intestinal obstruction. We will consequently supply fluid nourishment to this patient by means of proctoclysis with the Murphy drip method using 1 ounce of some concentrated predigested food in 4 ounces of normal salt solution given by a very slow drop method every four hours and aside from this not to exceed 1 pint of normal salt solution is given by very slow drop method whenever the patient is suffering from hunger or thirst. On the third or fourth day the patient will be given beef tea by mouth. On the following day broth or watery gruel and these articles will be continued until about two weeks from the date of operation when buttermilk and other liquids will be given. On the fifth day thereafter he will be given 1 ounce of colorless and tasteless castor oil in a little fruit juice or a little cream. In case there should be gaseous distention notwithstanding the precautions which have just been described gastric lavage will be made at 105° F after cocaineizing the pharynx. This may be repeated several times if necessary but usually it is not required because gaseous distention almost never occurs if this plan is employed.

EXCISION OF COCCYX AND REPAIR OF VENTRAL HERNIA

Summary Technique of excision of coccyx. Technique of repair of ventral hernias.

THE patient is a woman aged forty three years. She comes to the hospital because of a tumor mass in the abdominal wall and pain over the coccyx.

She was operated on for a ruptured appendix in December 1917. At that time the abdominal wound was drained. She was in bed for five weeks. Six months after operation the patient was operated on for a rupture in the old appendical scar. The patient now presents herself because of a bulging of a tumor mass which has appeared in the lower angle of the old laparotomy scar. She was operated on in June 1918 through a low midline incision for suspected ectopic pregnancy which was not found. She also complains of sharp neuralgic pains in the region of the coccyx. At times the pain is so severe that she almost faints. Past history is negative.

Physical examination shows an appendectomy scar painful to examination. On standing or coughing a globular mass appears at the lower end of the abdominal scar. The tumor mass is readily reducible.

This patient has a history as shown of intensely painful coccyx. In fact she cannot sit down with comfort on an ordinary chair for a single moment. She is simply in terror and upon our examining the coccyx yesterday she almost jumped off the table it hurt her so.

We make this curved incision upward over the lower end of sacrum so as to keep away from the anus as far as possible. With this chisel we separate all the lateral attachments of the coccyx lifting it out of its location and cutting the small connective tissue bands which extend to the surrounding tissues. Then we place a piece of gauze into the space from which we

have lifted the coccyx, so as to control the hemorrhage for a moment, and by means of these large bone-cutting forceps we cut off the coccyx at its attachment to the sacrum. The coccyx is now entirely free except for its anterior and a few lateral attachments. With the same chisel we loosen all of the lateral and posterior attachments, which are quite solid, and therefore a little difficult to loosen. There is a little fragment of bone remaining which must be removed, because that might cause pain, this will leave a perfectly smooth end of the sacrum.

In order to leave the wound perfectly dry before suturing it we tampon it with dry gauze which is left in place for five to ten minutes. The surfaces are then brought together with fine interrupted catgut sutures applied with a short curved needle for the purpose of obliterating any dead space. The skin incision is crescent shaped, 6 cm. in length with the convexity directed upward. This is accurately closed with fine horsehair sutures, attempting to secure absolutely perfect coaptation.

It is of the greatest importance to keep this wound clean in order to prevent infection because of its proximity to the anus, and consequently especial care must be taken in dressing this wound. We will place a separate dressing over the wound covered with vaselin. Then we will place a third dressing still farther down right next to the anus. In that way we hope to prevent the wound from becoming soiled. We will have the patient lie on her abdomen for the first four or five days until this wound is healed. The amount of relief she will get from this operation will be very great. By taking these precautions I am confident that we will have primary union.

The dressings are of the very greatest importance, and we fix them securely in position by placing a separate broad rubber adhesive strip over each one of the three individual dressings. In case one of these should be displaced, the other two are likely to protect the wound. Much time and trouble is saved both for the patient and for the surgeon if great care is taken in this particular. If you are shiftless about the primary or any subsequent dressing of this wound, it will cause the healing to be extremely slow and unsatisfactory, while if the above pre-

cautious are carefully carried out one or two dressings will suffice to secure a perfect healing of this wound

VENTRAL HERNIA

This patient has also a ventral hernia and evidently some postoperative peritoneal adhesions for which she really came to obtain relief. When she stoops there is a bulging in the region of the abdominal scar and the adhesions distress her to a marked extent. We treat postoperative ventral hernia of this variety in the following ways. We expose all of the original layers namely the anterior layer of the fascial sheath of the rectus abdominis muscle the muscle itself and the posterior layer of the sheath of the rectus with the transversalis fascia and peritoneum throughout the length of the hernia. We have here omental adhesions to the old abdominal scar and the omentum has carried down with it the transverse colon. We dispose of this by clamping the adhesions with forceps cutting and ligating them. There is another adhesion at the very uppermost end of the old incision. Inspecting the original appendix operation we find that there is nothing abnormal at this point. The gall bladder is also normal. The left ovary contains a cyst 4 cm in diameter which has a very thin wall and has ruptured on touching it with the hand. The right ovary also contains a small cyst which I will open. It is a hemorrhagic cyst. Now I explore the cecum and find it free from adhesions. There are a few small adhesions between the omentum and the small intestine. The uterus contains a number of very small fibroids so small that they are really of no importance. It would be impossible to remove them without removing the entire uterus because they are distributed through all parts of the uterus proper. The uterus shows a tendency to tilt backward so I will shorten the round ligaments somewhat by looping them over and suturing them to their normal attachments on the anterior surface of the uterus just in front of the attachment of the fallopian tubes. I place three chromicized catgut sutures on each side so that I shall be sure the shortening will be permanent. If you apply only one suture the shortening is liable

to disappear because the sutures will pull out. The round ligaments are strong in this case, so I am sure they will hold the uterus in its normal position. They are not intended to carry any weight, but will simply tilt the uterus forward.

We now have the uterus in its correct position, and we shall direct our attention toward the abdominal wall. The hernia is 5 cm in length. At the lower end of the incision we might free all of the tissues of the abdominal wall leaving the layers altogether behind the deep *fascia*, and then conveniently overlap those layers according to the method introduced by Joseph Blake some years ago if we chose to do that operation. In this case, however, the rectus *abdominis* muscle on each side is so nearly normal that it will not be necessary to imbricate as Blake did, we will simply lay bare the rectus *abdominis* muscle on each side and then carry our deep silkworm-gut sutures through all the layers down to the *transversalis fascia* and peritoneum, and leave them untied for the present while we suture each layer separately with fine catgut. It is well to divide the abdominal wall into four layers for the purpose of closing it, the deepest layer containing the *transversalis fascia* and the peritoneum, the next layer, the rectus *abdominis* muscle with all of its connective sheath and the third and fourth layers—superficial *fascia* and skin. It is important in suturing these layers to use just enough force to bring the surfaces together and not enough to cause pressure necrosis. This greatly increases the comfort of the patient, reduces the likelihood of *twitch* abscesses, and secures a proper and satisfactory healing with a wound that will be free from the possibility of the development of a ventral hernia. Each layer is sutured with catgut except the skin, which we prefer to suture with horsehair. After all these layers have been sutured we tie the silkworm-gut sutures which have been left untied up to this time. They are tied just sufficiently tight to hold the surfaces together and protect the patient against separation of the wound in case of vomiting or coughing but we are careful not to tie them tightly enough to cause pressure necrosis. In that way we can be absolutely certain that we will not have a recurrence of the hernia.

Suturing of these wounds is quite as important as the freeing of the edges so as to have each layer separate. We suture the peritoneum with fine catgut, because if you use heavy catgut you are liable to cause irritation of the peritoneum, which may result in adhesions. In suturing the peritoneum we are careful to turn the peritoneum outward so that no portion of the raw surface comes in contact with the intra abdominal organs. We have arranged the omentum so it covers up the intestines and separates these from the abdominal wound. The peritoneal wound from the abdominal side is now absolutely smooth. There is not one particle of raw surface exposed. If one is in the habit of tying sutures tightly, then it will not be safe to apply separate sutures through the rectus muscle, because these muscles will not bear tight suturing. If, on the other hand, one ties the sutures only just tightly enough to bring the surfaces together, then this is an important layer, and this suturing will result in a very much more satisfactory wound than if you leave this layer to chance. We will place a few chromicized catgut sutures through the deep fascia so that if the ordinary catgut should happen to absorb too quickly the chromicized catgut will protect it.

CLINIC OF DR. CARL BECK

NORTH CHICAGO HOSPITAL

EXTENSIVE OSTEOMYELITIS WITH NECROSIS OF THE TIBIA—RADICAL OPERATION

Summary A patient with neglected osteomyelitis of the tibia—technic employed in the management of cases of this type after treatment

This patient is thirteen years old. He is a miner's boy referred by his doctor who has been treating him for over a year on account of an affection of the right tibia. It started with fever and chills and led to the formation of an abscess which showed no tendency to heal. Several operations consisting in incisions of abscesses and facilitating the discharge of small spicules of bone were performed. The bone was scraped several times without avail. Finally a large piece of bone made its appearance on the outside but it shows no tendency to be extruded and every motion of it causes pain. From different portions along the surface of the leg oozes thick yellow bloody pus (Fig. 240). The ankle region compared with the other side is considerably swollen and tender. The boy is pale and shows signs of chronic suppuration. The urine however is still normal and does not show any of the characteristic signs of amyloid degeneration. The x-ray picture (Fig. 241) shows a very extensive osteomyelitis leaving no doubt that the entire tibia from epiphysis to epiphysis is in a state of inflammation and partial necrosis. The treatment of these cases can only be one of a great deal of radicalism if any success is to be expected. It means nothing less than the removal of the entire diaphysis of the tibia with the expectation that the periosteum which is left behind will form a new bone. The operation is performed in the following manner:

Under Esmarch constriction so as to lose as little blood as possible because the boy is anemic we remove first the large

necrotic bone "sticking" out from the wound by prying the loose at the bottom and then capsing away all the granular parts from the bone and soft tissue. This leaves a fairly clean surface showing however that the bone is riddled with abscesses and necrotic portion through and through.



Fig. 40.—Extensive osteomyelitis with necrosis of tibia. Lesser before operation not ceable feature are the necrotic bone protrusions from the wound the multiple discharging sinuses and the swelling of the foot.

remove the periosteum bluntly on both sides which is very easily with a Gigli saw underneath the tibia and saw it through in the center raise the lower and the upper fragment upward and separate them from the periosteum. This is easily done but toward the knee the separation becomes of course very difficult since the periosteum is closely adherent and very thin.



Fig. 241. Extensive osteomyelitis with necrosis of tibia. x Ray before operation. Large sequestra are discernible in the center of the shaft and at various points, especially toward the upper end, what appears like cloaca may be seen.

necrotic bone sticking out from the wound by prying the loose at the bottom and then scraping away all the granular parts from the bone and soft tissue. This leaves a fair surface showing however that the bone is riddled with necrotic and necrotic portions through and through.



FIG. 7-3 Extensive osteomyelitis with necrosis of tibia. Lesion before operation. Note the features are the necrotic bone protruding from the wound, the soft "draining" granules and the swelling of the foot.

remove the periosteum bluntly on both sides which is very easy. Up a Gigli saw underneath the tibia and saw it through in the center raise the lower and the upper fragment upward and separate them from the periosteum. This is easily done but toward the knee the separation becomes of course very difficult since the periosteum is closely adherent and very thin.

fix the flaps by sliding them into the cavity and pack the upper and lower corner. Then the leg is supported by a splint, inasmuch as the fibula forms the only support now, and it can easily be broken on account of the heavy weight of the foot, particularly if the child should be restless.

We expect that the periosteum in the center will form a new ledge of bone, which will afterward be quite a good support again as a sort of tibia as we have seen it happen in similar cases before. This is particularly true in younger individuals, who have a remarkable reconstructive power of bone after subperiosteal resection.

The after treatment of these cases is very simple. Great care has to be taken that the suppurations are kept in check by cleaning very frequently a great amount of debris which comes especially from the upper and lower corner of the wound. It is only seldom that we have to deal with such extensive osteomyelitis requiring a total resection of the tibia. In most instances we can leave a thin ledge of the tibia which acts as a very good starting point for bone formation.

and here we have to bite out all the pathologic tissue with a Rongeur forceps. It is not very easy and we have to go very close to the epiphyseal cartilage. We do the same thing in the ankle region where the tibia is diseased clear down to the joint and by scraping and biting out the diseased bone we finally have the whole area free. The picture (Fig. 232) shows the condition at this stage the two clean surfaces indicate the inner surface of the periosteum of the tibia with the groove at the bottom where the posterior crest of the tibia was lying. Above



Fig. 242.—Extensive osteomyelitis with necrosis of tibia. At operation all dead bone has been removed and the cavity in the leg is widely open.

and below is shown clearly the surface of the bone which is healthy. On the sides one can see the ragged edges of the wound. We do not attempt to make this a clean incision but just trim with the scissor the most ugly looking parts of granulomatous tissue off from two flaps one which is like a tongue dipping down into the upper corner and one like a tongue into the lower corner of the defect. We know that if we sew that together we shall not have healing on the upper and lower corner consequently we sew together only the center part and

CARCINOMA OF THE UPPER EYELID

Summary A patient presenting an ulcerating lesion of the upper lid of six months duration. Technic of removal and plastic repair of the lid results

THE next patient is a Greek fifty years old who for a half year or more has been suffering from an affection of his left upper lid referred by Dr S who suspects either syphilis or tuberculosis. The left upper lid is covered by a granulomatous ulcerated mass which increases the size of the same consider



Fig. 243. Carcinoma of upper eyelid. Carcinoma of lid before operation

ably and makes its motion difficult although the muscles seem to be active. The borders of this ulcer are hard irregular, and contain in some portions nodules which may be tubercles. Removal of one of the same and microscopic examination reveals an epithelial cell nest with a good deal of detritus. The inflammatory reaction is not very severe there are no glandular

infections and the patient has outside of this affection absolutely normal health. The growth has been rather slow increasing very little day by day (Fig 243).

There remain only two ways of treating which can be effective. One is the treatment with x-ray or radium, the other is surgical treatment resection of the tumor and plastic reconstruction. The treatment with x-ray and radium considering the neighborhood of the absolutely normal eye seems to me a little risky, and I therefore choose the surgical method. Besides this economic reasons prompt me to do rather a quick radical cure than the slower and expensive treatment of radium or x-ray. Under a general anesthetic the tumor is excised accurately within normal epithelium and it is found that the muscle of the upper lid can to a certain degree be retained so that we have hope of some physiologic action after plastic. This is an important matter inasmuch as a stiff immovable upper lid has the same effect as ptosis of the lid and covers the otherwise normal bulbus so that the same becomes useless while the operation performed in such a manner that the bulbus remains free making the upper lid stationary during the period of the open eye will allow no closure of the eye during sleep and consequently a dryness of the cornea with subsequent ulceration. If it is therefore possible to retain activity of the upper lid it is a great gain. The operation is performed in the following manner. A flap taken from the region of the forehead above the eye is swung around into the defect leaving its contact at the base of the flap with good nutrition toward the temple region (Fig 245).

In the removal of the carcinoma the border of the eyelid had to be removed and with it the eyelashes. It is impossible to replace the same and it is not advisable to make any attempt inasmuch as hair brought over from some region while it may be possible will not grow in the same manner as normal eye lashes but will grow toward the bulbus and cause discomfort similar to that of entropion with a normal lid border. I prefer therefore to have a lid border without any eyelashes. The conjunctiva of the upper and lower eyelid is sutured temporarily



Fig. 244.—Carcinoma of upper eyelid. Defect in lid after removal of tumor filled by transplantation of pedicled flap from the forehead. Note that the lids are sutured together at the conclusion of the operation.

with three stitches so as to make the lid absolutely immovable during the healing process. The result is ideal—the eyelid re-



Fig. 247.—Carcinoma of upper eyelid. Degree of functional recovery at the present time.

constructed, normal allows of motion upward and downward and allows the man to open and close his eye almost like a normal eyelid (Figs. 245, 246, 247).



Fig. 245.—Carcinoma of upper eyelid. Degree of functional recovery at the present time



Fig. 246.—Carcinoma of upper eyelid. Degree of functional recovery at the present time

WEBBED FINGERS

Summary Technic of operation for syndactylism—the simplest procedure—tubulization of the web at the base—when applicable marked scar tissue formation, as in present case a contraindication transplantation of skin from chest

This fifteen year old girl has a congenital deformity of the type known as "webbed fingers." When she was three years old this deformity was operated upon in an unsuccessful manner, with the result of scars between the fingers instead of the freely movable scarless web. Affected on the left hand are only the last three fingers—a web up to the middle of the sec-



Fig. 248.—Webbed fingers. Patient before operation, note scar tissue in webs due to previous unsuccessful surgical interference

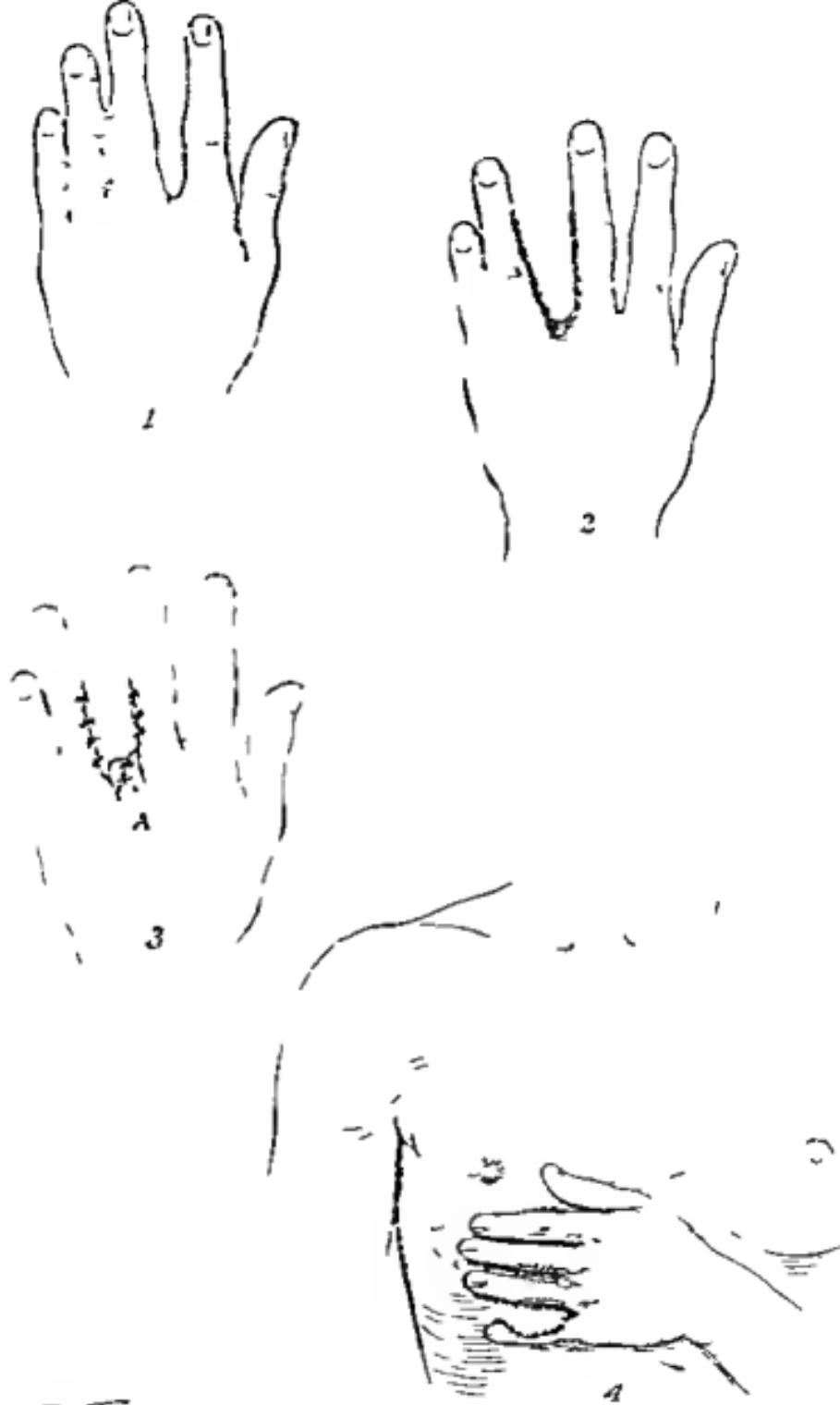
ond and third phalanx between the middle and fourth and between the fourth and the little fingers. On the right hand there is only one web between the middle and the fourth finger (Fig. 248). The girl is otherwise perfectly healthy. Motion is somewhat impaired. Not only can the fingers not be spread, but they are also not so flexible as they ought to be. The reason for the failure of operations of this kind is that all such separations of skin have a great tendency to heal in the same manner as before the operation unless there is a real plastic

performed which places skin and flexible skin at that at the base of the phalanges. If this patient had not been operated on before unsuccessfully we would do a very simple method which has proved to us universally very satisfactory and gives almost an ideal result. It can be done under local anesthesia provided there is sufficient material of skin constituting the web so that we can make that plastic. We cut on the dorsal surface a small flap of rectangular shape with its base toward the wrist and form a little tube out of it and then slip this tube through a slit at the base of the web and sew its border exactly into the palmar surface. A rubber tube or a catheter around which this skin tube is formed facilitates greatly this maneuver. After a few days the catheters are removed and we find regular button holes at the bottom of the web. After this the web is split with a stroke of the scissors clear down into the button hole and either side secured by a few sutures or even without sutures it will never grow to the other side.

This maneuver is only possible however if the web is very loose. It is not possible in cases of close adhesions or irregular synecchia of the fingers in which the bones with their coverings are closely joined with the bones of the other finger a condition which is usually known under the term syndactyly.

In this case we had to proceed therefore in a different manner. The scars had partly transformed the web into a rigid mass without elasticity. Fortunately for the patient the doctor was not daring in making the incisions as low toward the metacarpal bones as they have to be made and so we had at least that part of the skin at our disposal for plastic purposes. By making two triangular flaps one on the dorsal and one on the palmar surface with the base of the flap toward the wrist and the triangles as long as possible we prepare our skin for the space between the fingers. The web is cut in the old scar and the scars resected from the soft tissues around them the skin united along the fingers and the two triangles placed so that their sides meet in the middle and their points reach into the

Fig. 249.—Webbed fingers. Diagrammatic presentation of operation as performed on patient in clinic.



Two hands —
724

Fig. 249

performed which places skin and flexible skin at that at the base of the phalanges. If this patient had not been operated on before unsuccessfully we would do a very simple method which has proved to us universally very satisfactory and gives almost an ideal result. It can be done under local anesthesia provided there is sufficient material of skin constituting the web so that we can make that plastic. We cut on the dorsal surface a small flap of rectangular shape with its base toward the wrist and form a little tube out of it and then slip this tube through a slit at the base of the web and sew its border exactly into the palmar surface. A rubber tube or a catheter around which this skin tube is formed facilitates greatly this maneuver. After a few days the catheters are removed and we find regular button holes at the bottom of the web. After this the web is split with a stroke of the scissors clear down into the button hole and either side secured by a few sutures or even without sutures it will never grow to the other side.

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opposite side, thus making a broad skin between the fingers (Fig. 249, 34)

After having completed this operation between the middle and the fourth and the fourth and the last finger, we find of course, that we have not enough skin on the little finger, having used most of the skin for the others and it is necessary to cover



Fig. 240.—Webbed fingers. The flaps raised from the skin of the chest have been sutured over the denuded areas on the fingers. Note that the skin edges about the areas from which the flaps have been raised have been approximated if this is not done at the time of the primary operation the discharge from the granulating surface may become a source of marked annoyance while healing may be greatly delayed.

the defect of the little finger on the inner side extending from the median line on the dorsal side to the median line on the palmar side and from the base of the finger to about the base of the first phalanx in length a defect of about 2 inches by 1 inch in diameter, from somewhere else and the best source is afforded by the skin of the opposite side of the chest. We therefore sew the finger to the chest in the way you see (Fig. 20)

a method which we use very frequently to cover defects on hands or fingers

Note —One week later this flap was cut at its broad base and sutured into the fourth side of the defect of the finger, the three sides having been sutured at the first operation, and the plastic was thus completed with an ideal result, restoring the fingers to normal state and function

At this time the plastic on the other hand was performed in the same manner as on the left



CLINIC OF DR. GATEWOOD

PRESBYTERIAN HOSPITAL

DUODENAL ULCER

Summary Difficulties occasionally encountered and differentiating acute cholecystitis, perforated duodenal ulcer and acute pancreatitis; the surgical treatment of ulcer; importance of the after-care outline of the post-operative management of ulcer cases.

THIS patient entered the hospital about three weeks ago with the following history:

For the last eighteen years she has had attacks of pain in the epigastrium which came on two to three hours after meals. These attacks would be relieved by food taking and by soda. She has been awakened at 2 o'clock in the morning. Such attacks would last from four to eight weeks and then the patient would be entirely free for a similar period. At one time she had no distress for almost a year. About the time the trouble began she had a severe attack of pain in the right epigastric region which was severe enough to require morphin for relief. There was no jaundice at this time but the attending physician diagnosed gall stones. Since then she has had no similar attack until three weeks ago or the day before she entered the hospital. Not feeling very well on that day she ate but little. She went to bed early in the evening and about 1 A.M. was awakened by a severe pain in the region of the gall bladder. This pain radiated to the back. It was severe enough to make her perspire freely and the physician who was immediately called administered a hypodermic. She obtained partial relief two hours after the injection. The pain started again later in the morning and was diffuse over the entire abdomen. She vomited many times during the night and morning but the vomiting ceased during the day. I first saw her about 6 o'clock in the afternoon.

at which time she was much more comfortable than she had been for several hours.

Examination revealed a fairly well nourished woman in no great distress. The entire abdomen was very rigid but the right side seemed much more so than the left. There was marked tenderness in the right hypochondrium, but she was so tender that accurate palpation was entirely out of the question. Her temperature was 101° F and the leukocyte count was 19,600. I advised an immediate exploratory, the diagnosis resting between acute cholecystitis and perforated duodenal ulcer with, of course the possibility of an acute pancreatitis being taken into consideration. She refused operation until her husband came from a distant city so palliative treatment was instituted giving nothing by mouth 8 ounces of normal salt solution were given every four hours by rectum.

At 11 o'clock the patient was still more comfortable. Her temperature had dropped to 100.6° F and the leukocyte count was 17,500. Believing that she probably had an acute cholecystitis on account of the absence of signs of general peritonitis and as her general condition seemed to be improving I deemed it advisable to watch her for a few hours.

The following morning she seemed better and operation was again delayed believing now that the patient was suffering from cholelithiasis with cholecystitis. On account of the old history suggestive of ulcer and the possibility of a localized perforation ulcer management was instituted. This consisted in starvation for twenty four hours or until positive that there was no leak into the free peritoneal cavity. During the starvation period and for the next three days she was given 8 ounces of normal salt solution per rectum every four hours. Given slowly with a small tube there is no difficulty as a rule in having the patient retain the fluid. Nutrient enemata might have been used but our experience has been that most of them are somewhat irritating to the bowel and as there was no immediate danger of starvation acidosis salt solution was preferred.

Her temperature gradually subsided during the first week of management. On the seventh day it again reached 100.8° F.

and on the eighth day it was up to 102° F. Her abdomen had remained more or less tender during this entire time, particularly in the right upper quadrant. On the seventh day she called my attention to the fact that she was tender in the lower left quadrant of the abdomen and I was able to make out a definite sense of resistance in the region of the sigmoid. Bimanual examination revealed a mass in the pelvis which was very firm and not very tender. My first impression was that this was a fibroid but on going into the history carefully it seemed more like a well defined abscess. Dr. Heaney saw her about this time in consultation and advised an exploration per vaginam with a trocar. This was done and a considerable quantity of pus found in the culdesac. This pus had no odor and did not appear to be gonorrhreal or tuberculous. Microscopic examination of the pus showed staphylococci.

Her temperature came down to normal following drainage of the abscess and remained almost normal for the next ten days. As the tenderness throughout the abdomen gradually subsided there still remained a marked tenderness in the right hypochondrium. I was able to distinctly make out a mass in this region about seven days after she came into the hospital. This mass varied in size from time to time extending as far down as the umbilicus at times but never entirely disappearing. It seemed to be oval in shape and remained quite tender. I therefore advised an exploratory operation which we are making this morning with the tentative diagnosis of hydrops of the gall bladder following an acute attack of cholecystitis probably with a cystic duct stone.

I am making the usual Bevan S shaped incision. I find that the abdomen contains many firm fibrous adhesions which I am carefully breaking up by blunt dissection. The stomach is firmly attached to the anterior abdominal wall and to the liver. I am now able to explore the gall bladder which is small normal in color and contains no stones. The tumor mass which I have been able to palpate is edematous omentum in the center of which is probably a small abscess. The amount of inflammatory reaction in it accounts for the fluctuation in its size. The lower

right quadrant of the abdomen is free from adhesions. It is now evident that this patient had a perforation of a duodenal ulcer three weeks ago, and that the infection migrated across the upper abdomen and down the left side to the lower left quadrant without involving the entire abdominal cavity. To my mind this is a most unusual picture. I will remove the omentum which formed the mass after transfixing and ligating its pedicle.

The question now arises of how to treat the ulcer. As I separate the adhesions between the liver and duodenum I break the thin fibrous covering over the perforation. It is possible that the patient might have entirely recovered had accurate ulcer management been continued without operative interference. However, I feel that it is much safer to remove the ulcer, and I am now doing this by cutting it out with the electric cautery and inverting the raw edges with two rows of Lambert sutures. I have compromised the lumen of the duodenum so much in this closure that I fear obstructive symptoms may follow. It will be safer, therefore, to do a posterior gastro-enterostomy, which I am now doing by the old Billroth method (described by Dr. E. W. Andrews in the *Surgical Clinics of Chicago*, February, 1918, p. 1), using a short loop and making a three-row suture closure. The abdomen is closed without drainage.

I might stop for a moment to consider the indications for surgical therapy in gastric ulcer. There are probably relatively fewer cases operated upon in this clinic than in any other large clinic in the world. As a result of the careful clinical researches of Dr. B. W. Sippy we feel that the indications for operative interference are very definite. In the first place, of course, perforations are always surgical, and had our diagnosis been definitely made at the time this patient entered the hospital no delay would have been countenanced. Second, carcinoma suspects. If, either from a clinical or radiographic standpoint there is good reason to suspect malignancy, the case should immediately be given the benefit of an exploration with the idea of a resection if at all possible. Third, pyloric obstructions which are not relieved after thorough management. Many obstructions are due to perigastritis; others are the result of spasm.

These obstructions will promptly disappear in the majority of cases if good medical management be instituted. Fourth, adhesions. Occasionally only do adhesions produce symptoms which demand operative interference, although I have seen them cause obstructive symptoms several times. Fifth, unmanageable cases. There are a certain number of patients who could be made well by medical management, but who are not willing to devote the necessary time and funds to it. Patients of this class can often be cured by resection of the ulcer.

What operative interference is to be recommended is still an unsettled question. However, there are some very definite indications for certain operations. For example, no one will question the wisdom of a gastro-enterostomy in a definite pyloric obstruction, nor of resection of the ulcer in suspected carcinoma cases. Since we have learned that gastro-enterostomies do not drain the stomach, we never do a gastro-enterostomy for an ulcer of the fundus or lesser curvature. Except in rare instances those cases should be treated by accurate medical management. I would except those old calloused ulcers of the greater curvature which had recurred after good management, especially in individuals who would not follow their management carefully. In such cases I believe excision should be done. Excision should also be done in cases of exploration for other conditions where the risk to the patient is not materially increased by getting rid of the ulcer. I cannot agree with those who urge resection or excision of all ulcers clinically demonstrable. Could we make examinations of the stomach at the operating table with a thoroughness equivalent to that made postmortem, removal of clinically demonstrable ulcers might be advisable, but as such examinations are not possible, we are unable to locate many ulcers at operation, to say nothing of the increased risk to the patient incurred by operating and the fact that many such ulcers can be cured by medical management.

I might take this case as an example of what seems to me to be necessary in the postoperative management of gastric or duodenal ulcer. I was considerably amazed not very long ago while visiting the clinic of one of the best men in this country to

hear a patient who had had a gastro-enterostomy two weeks previously for a duodenal ulcer say to the resident as she left that she still had the same pain which she had upon entering the hospital. His reply was "That is all right you will get over that by and by." When she further inquired as to what diet she should take he told her to eat everything. I believe that most surgeons are coming more and more to recognize that their work is not ended at the time the patient has recovered sufficiently to leave the hospital. In stomach cases particularly careful medical management should be instituted either by the surgeon or by an internist.

We shall feed this patient nothing for the next twenty-four hours and supply liquids by the rectum. At the end of that time we shall begin with water and give 1 to 2 ounces every hour, and on the second day we shall add equal parts of milk and cream, 1 ounce every hour. The quantity of milk and cream will gradually be increased to 3 ounces an hour on the third or fourth day and she will be allowed all the water she desires. Carbohydrates should be given early in all cases, and therefore, about the third day we shall begin to feed her cereals such as rice farina, and strained oatmeal in 2 to 3-ounce quantities, with a moderate amount of sugar. This diet will be continued for approximately ten days. We shall then begin to give powders, as in the usual ulcer management. In this particular case we have not been able to ascertain her exact acidity because we have not felt that it was safe to aspirate. In the average case the exact amount of alkali necessary to neutralize the acid would have been determined before operation.

We shall give her a powder containing 30 grains of bicarbonate of soda and 10 grains of magnesia oxidum (ponderosum) every two hours midway between feedings. On the alternate hours she will be given 10 grains of calcium carbonate and 30 grains of bicarbonate of soda. Occasionally a patient is very susceptible to magnesia and if diarrhea occurs the calcium powders are used in place of part of the magnesia powders. If constipation occurs the number of magnesia powders should be increased.

The diet will be gradually increased so that at the end of two weeks she will be getting three meals a day with three lunches between meals. These meals are in addition to the hourly feedings of milk and cream. During the third week we will feel safe in aspirating the patient, and her exact acidity will be determined and neutralized. The patient should be able to leave the hospital at the end of three weeks. At this time she will be given the following typewritten diet, which is essentially the ulcer management outlined by Dr. B. W. Sippy after years of experience with this type of stomach case:

"It is to be borne in mind in making out any ulcer diet that the function of the diet is to neutralize the acid formed in the stomach and to furnish nourishment to the patient. It has long been conceded that the hydrochloric acid is the potent factor in keeping an ulcer from healing. Of course, in addition to the acid factor, there is the mechanical element to be considered, *i.e.*, the passing of food over the raw spot. In general, the foods to be selected are those which are high in combining properties, and at the same time high in nutritive value. These foods should be easily assimilable. The best single food of this sort perhaps is cream, but as many people do not like it and it may cause some bowel disturbances it is usually mixed with an equal part of milk. This is the basis of the best ulcer diets. The oftener the patient is fed, the less acid accumulates, so that if the patient is to be treated ideally there will be no free acid in the stomach at any time during the day. Such a patient can have no discomfort from burning, and when burning is

two weeks, after which begins feeding of equal parts of milk and cream, 3

feedings every two hours, doubling the amounts. The powders are to be doubled in quantity and taken midway between feedings as before. At the end of six weeks the length of time between feedings may be increased to three hours, but the patient should take five or six meals a day for the next six months. This can be readily accomplished by eating three regular meals with the family and taking a glass of milk and cream between meals when it is not possible to obtain a lunch. In event of distress at any time it is well

to return to the hourly feedings until the cause has been established. There should be absolutely no stomach distress.

"At all times avoid such foods as pickles, potato salad, fried potatoes, coarse vegetables, strong coffee, and highly seasoned foods of all kinds should be avoided.

"During a period of a year or more milk, cream, cereal, soft eggs in any form except hard boiled or fried, vegetable purées, mashed potatoes, bread and butter, and a piece of well-cooked meat should form the basis of the diet."

The most essential part, to my mind, of the postoperative management is to make the patient your confidant and obtain his co-operation in the management. The reason for administering the powders is explained carefully to him and the powders are labeled so that he knows exactly what he is getting. This patient will be instructed to report to us each month either in person or by mail for the next six months to a year.

Postscript—Three months after operation the patient reports that she has gained 12 pounds in weight, has no discomfort, and feels perfectly well.

CLINIC OF DR. ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

OBSTRUCTION OF COMMON BILE-DUCT

Summary A patient with a long jaundice giving a history of a gall stone attack three years previously difficulty of differentiating chronic pancreatitis stone and carcinoma Operation—stones in common duct at junction with the cystic duct simulating an hour glass gall bladder with calculi danger of grave injury to ducts in operations of this type necessity of wide exposure and a deliberate, painstaking operative technic

THE patient I shall operate this morning is a woman of fifty, who gives the following history

Three years ago she had a severe attack of pain in the right upper quadrant of the abdomen, consistent, from her description and from the description of her attending physician, with being a gall stone attack. This was followed by a mild temporary jaundice. She had no further trouble until about eighteen months ago, when without any pain or other symptoms she became jaundiced and remained so for four or five weeks. This finally cleared up. Six weeks ago she again—without any pain or other symptoms, such as chills or temperature—became jaundiced. She comes to us now very deeply jaundiced and with clay colored stools. She has lost a good deal of weight and strength. Careful examination and thorough investigation fails to disclose any other facts. In other words, it is a silent jaundice, a jaundice coming on without any pain six weeks ago, which has persisted since that time. The case is one of a great many similar cases that we have dealt with in this clinic. My clinical diagnosis is not a definite one. I am inclined to believe that she has an obstruction of the common duct, and that this obstruction may be due to one of three things—gall stones, chronic pancrea-

titis, or carcinoma of the pancreas. Because of the fact that three years ago she had an acute and definite attack of pain consistent with being gall stone colic, I am inclined to believe that there is a chance of its being an obstruction due to gall stones. It is, of course, quite possible that she has gall stones plus a chronic pancreatitis, or that her attack three years ago was due to gall stones, and since that time she has developed a carcinoma. After analyzing a large number of similar cases I feel that one is not warranted in attempting a definite diagnosis without doing an exploratory operation, and I have advised an exploratory with the idea of first making the diagnosis definite, and then, if the conditions found warrant it, removing the obstruction or instituting what seems to be the most appropriate surgical therapy. The patient's general condition is good. In spite of the jaundice her hemoglobin is above 70, and the time of coagulation of the blood is about four and one-half minutes. There is no heart lesion and no kidney lesion contraindicating a general anesthetic.

The patient is now etherized and I shall make the usual S-shaped incision that we employ in exploring the bile tracts. On opening the peritoneal cavity I come down at once to the gall bladder, about the size of my thumb packed full of gall stones, containing no fluid of any kind. It is embedded in adhesions between the gall bladder and omentum. I separate these with blunt dissection and in part, as you see by clamping the firm adhesions at two points and dividing between. With this S incision I obtain an admirable exposure of the operative field. Now, having separated the adhesions, I next attempt to examine the common duct. I find that I cannot introduce my finger into the foramen of Winslow, and that this entire area posteriorly has been obliterated by an adhesive inflammation. As I continue the exposure of the gall bladder, however, I find that it is apparently an hour glass-shaped gall bladder with a contraction near the neck of the gall bladder, and beyond the contraction an enlargement containing a large stone, which seems to be about $\frac{1}{2}$ inch or more in diameter. You will notice that I have been standing on the right side of the patient during this part of the

operation I shall now move to the left side in order to complete the deeper part of the dissection. I want to call your attention particularly to this step in the technic because we have found that moving to the left side and completing the deep part of the operation from that side has been of very great service and has made it very much easier for us to do complicated cholecystectomies and common duct work. Continuing my dissection and separating the adhesions I am not able to outline the common duct. I have freed the gall bladder as fully as I can from the liver with the exception of what seems like a broad massive adhesion very deeply situated. I do not dare to divide this however because I do not know exactly what it is. I think the wise thing and safe thing to do under the circumstances is to split the gall bladder open and attempt to split the cystic duct open and open the common duct in that way. You see that before opening the gall bladder I surround the area with pads. I divide first through the main gall bladder itself and then this contraction into the second hour glass pocket containing the large stone which I have described to you. I scoop the stones in the gall bladder into this spoon shaped instrument which we employ for the purpose and I now lift out the large stone in the second pocket beyond the contraction. As I do this you see there is an escape of a large amount of bile. Behind this big stone I pick out with the forceps two other stones and I now find what is a real surprise to me a very interesting condition the pocket containing the large stone is not a part of the gall bladder but is a tremendously dilated part of the common duct. I now introduce a probe down through the common duct into the duodenum and find no other stones. I also introduce a probe upward into the hepatic duct. I particularly want to call your attention to the fact that as I do this I find that what I thought was possibly a broad adhesion between the gall bladder and the liver is in fact the hepatic duct itself. If I had divided this with the idea that it was an adhesion I should have done irreparable damage to the patient (Fig. 251).

I now examine the pancreas and find that there is no mass in the pancreas and no evidence of carcinoma. I remove the

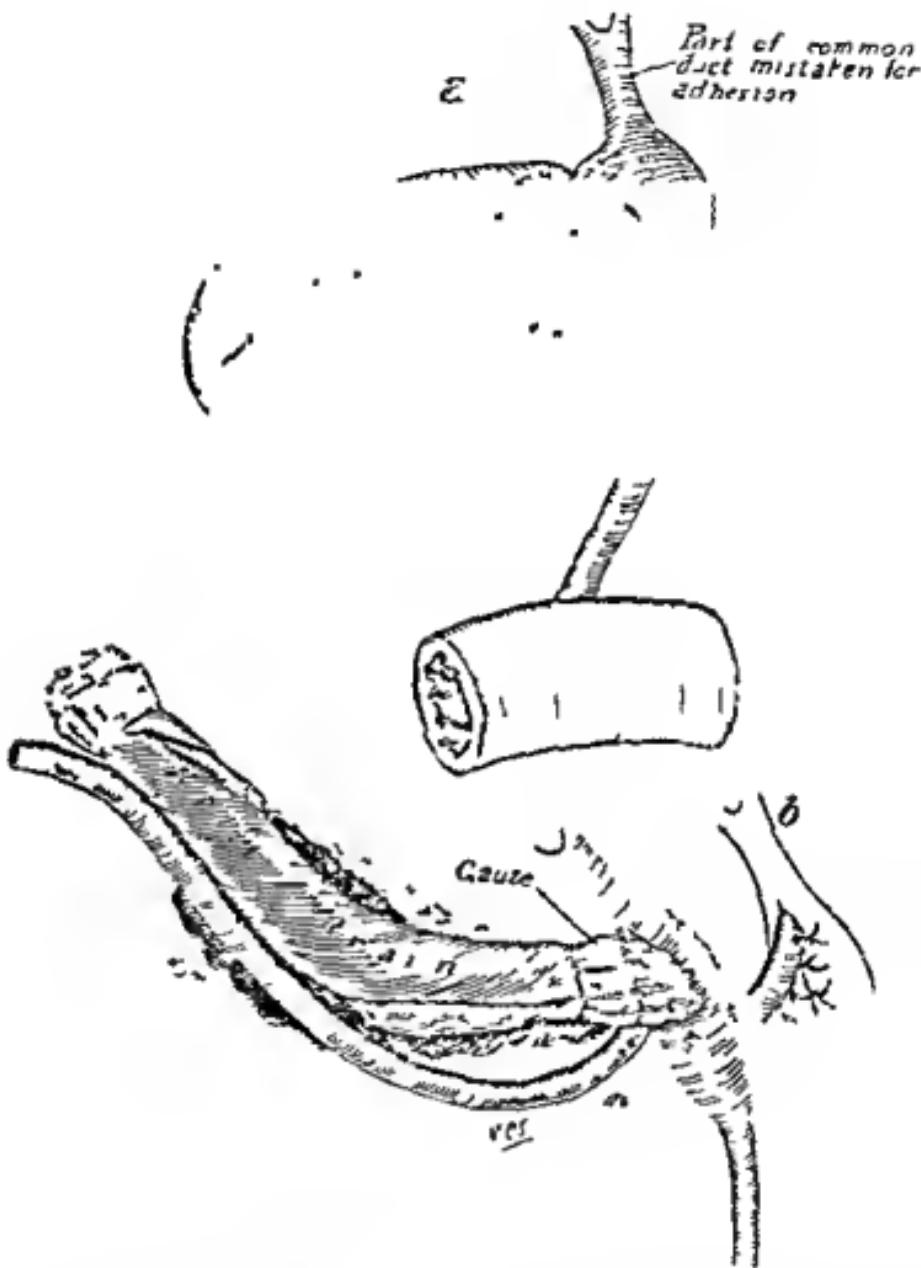


Fig. 251.—Obstruction of common bile-duct. *a*, Apparent hour glass gall bladder *b*, catheter sutured into common duct *c*, split rubber tube containing gauze placed over site of gall bladder with end extending to opening in common duct.

gall bladder, and in doing this have to clamp and ligate the large cystic artery. I now introduce a No. 14 American soft catheter into the hepatic duct for about $\frac{1}{2}$ inch and sew it into position with a piece of fine catgut. After removal of the gall bladder I close the large opening in the dilated part of the common duct with three sutures of fine catgut. I am going to leave in contact with the raw surface of the liver from which I have dissected the gall bladder a split rubber tube containing a piece of iodoform gauze, and leave about an inch of the iodoform gauze covering the opening in the common duct. I have a good deal of confidence that in cases of this kind the iodoform gauze is of value in reducing to a minimum the possibility of infection of the raw surface of the liver from the possibly infected mucus and bile that has undoubtedly come in contact with it during this operation.

This case to my mind is most instructive and shows very definitely the considerable risk that surgeons run in handling these complicated bile tract cases of injury to the hepatic or common ducts. You can see how easily in this case if I had been in a hurry or if I had not studied these structures with great care I could have clamped off and ligated off the hepatic duct itself. The case I think should be a lesson to us showing the great need of wide exposure and careful study of these cases in order to avoid any such serious injury.

After history.—The patient made a very satisfactory recovery. The tube and iodoform gauze were removed on about the fourth day and this produced considerable distress to the patient as the iodoform gauze held fairly firmly down deep in the wound. This is undoubtedly an objection and a strong argument not to use gauze in these cases. I think however that in infected cases it is a wise thing to use the gauze and that it is a good plan to reduce the discomfort to a minimum by using a split rubber tube covering the greater part of it. The jaundice rapidly disappeared. The hepatic duct was drained for ten days. One half of the silkworm gut stitches were removed on the ninth day and the balance on the twelfth. The patient made a complete and satisfactory operative recovery.

BRODIE ABSCESS

Summary Clinical history signs, and diagnosis of Brodie abscess technique of operation—mechanical cleansing of abscess followed by immediate closure

I WANT to operate this morning on a patient upon whom we have made a diagnosis of a Brodie abscess. I like to retain the name 'Brodie abscess' for a certain group of cases. The term was one which was in more common use thirty years ago than it is today, but it describes a certain type of case which has peculiar clinical findings and in which I have now for a long time been employing a certain definite scheme of surgical therapy. A Brodie abscess, as I use the term, is a small and usually deeply situated abscess in the bone without any extensive fistula and without any extensive osteomyelitis or necrosis.

This patient upon whom we shall operate this morning is a man of forty. When he was seven years of age he had an osteomyelitis of the right tibia and of the right humerus. You will notice a very great deformity of the right arm, the result of a very extensive necrosis of the shaft of the bone, with resulting great shortening. His right humerus is not more than half the length of the normal humerus on the left side. He has, however, fairly good use of his right hand and forearm. The disease in the right tibia was not as extensive, but resulted in an abscess and later the throwing off of a number of small sequestra. The leg eventually healed entirely and he has had no further trouble for about thirty three years. Within the last few months however he has been suffering from very intense pain in the leg on the tibial side and about 5 inches above the ankle joint. This pain is of a boring character and very intense. There has been no swelling of the limb or if any, very slight swelling, no redness, and no evidence of the development of a superficial abscess or fistula. At a point about 5 inches above the ankle joint on the tibia he himself points out an exquisitely tender area about the

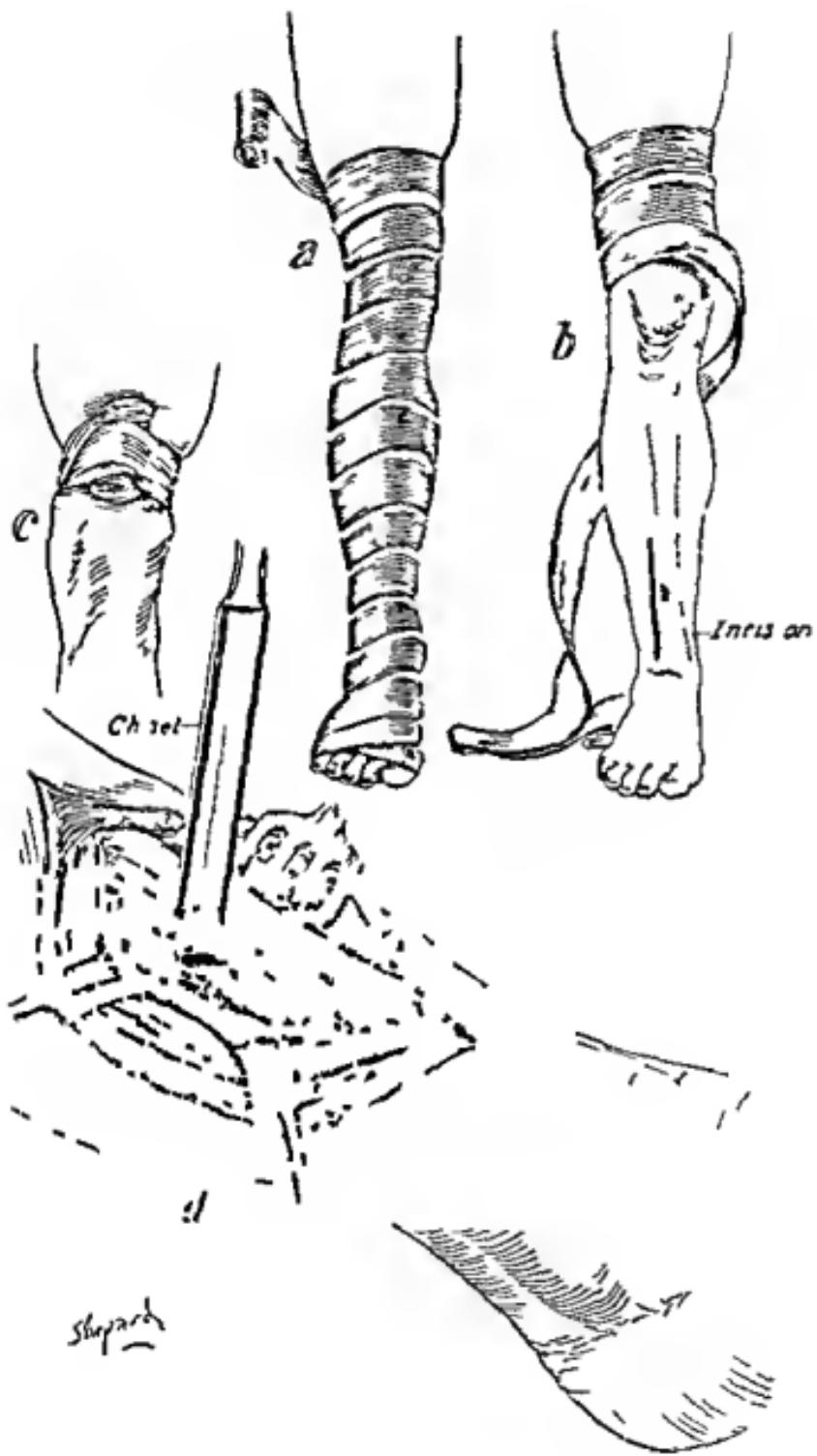


Fig 2a2

size of a quarter. The pain is worse at night. Some days he has been fairly free from it and other days the pain has been so intense as to incapacitate him for work. There is no history of syphilis. The Wassermann is negative. An x-ray picture shows, at the point of tenderness a small abscess about $\frac{1}{2}$ inch in diameter in the shaft of the tibia near the fibular side, and along the posterior surface of the bone. I have made, therefore, in this case a definite diagnosis of a small bone abscess of a type which I believe should be properly called a Brodie abscess.

We have developed in this clinic, since the introduction of the x-ray, a definite technic for the handling of these cases that has proved to be very satisfactory. I shall proceed to employ it in this case. The patient is now anesthetized and I shall first apply a Martin elastic bandage from the toes well above the knee joint in order to make the operation perfectly bloodless (Fig 252, a). I believe that this is a matter of a good deal of importance in doing this operation properly. I now remove the Martin bandage from below the knee and proceed with the operation (Fig 252, b, and c). I measure off quite accurately a distance of about $5\frac{1}{4}$ inches above the ankle joint as the location of the abscess as shown by the x-ray. Inasmuch as the abscess is toward the fibular side and toward the posterior surface of the tibia, I shall make an incision just external to the crest of the tibia about 5 inches in length, the center of which will be opposite the point of the abscess. This divides through the skin and superficial fascia (Fig 252 b). I now come down to the tibialis anticus muscle. I separate this carefully from the tibia and draw it to the fibular side. This allows me to expose the external surface of the tibia fully. There is, as you see no evidence of any inflammatory process here. The muscles, bone, and periosteum seem to be perfectly normal. I begin now and

Fig 252—Brodie abscess a b and c. Method of applying Martin bandage. In c the bandage has been removed from the leg below the knee and the excess roll inserted under the encircling portion so as to make pressure in the popliteal space. In b the

chisel away the posterior portion of the inner surface of the tibia 5 inches above the ankle-joint. I do this with a good deal of care so as not to run any risk of fracturing the bone. The first layers of bone that I remove are quite normal, but as I reach a depth of about $\frac{1}{2}$ inch I come rather suddenly on to a small bony cavity about as large as a cranberry. This contains a few drops of pus, but the cavity is made up mostly of granulation tissue. The walls of the cavity are very dense and hard. There is no piece of necrotic bone. I curet out the granulation tissue. I take a gouge and scrape the walls of the cavity and attempt to clean the cavity out thoroughly, as if this were a cavity in a tooth that I was preparing to fill (Fig. 252 *d*). You will see there is no bleeding. That is entirely controlled by our elastic bandage. The cavity now looks perfectly clean, and I will however, make some additional effort to sterilize this first with peroxid of hydrogen, which I pour into the cavity and leave there for a few minutes. I mop this out and then I fill the cavity full of 70 per cent alcohol and leave that for about a minute. I am not perfectly sure that the peroxid of hydrogen and the alcohol add anything to the mechanical preparation, and yet I think it is better to employ them, and we have made their use a part of our regular technic. We now mop out the alcohol, and then before I remove the Martin bandage I make a complete and accurate closure of the wound without any drainage. I have been very careful in the dissection to avoid injury to any vessel of any size, so that I do not think there is a possibility of hemorrhage of any moment. I now put on a rather copious dry dressing and over this a soft roller of gauze, and then, what I think is quite important, a flannel bandage from the toes well above the knee, making moderate pressure over the entire limb, which will control any ordinary bleeding that might occur. The patient will be put to bed and kept at rest for about ten days, and at the end of that time the soft tissues will probably be healed. It will, of course, require another five or six weeks for the repair in the bone to be completed.

We have had an opportunity of employing this technic in a good many cases in the last ten years and it has given almost

universally satisfactory results from the standpoint that we have in this way been able to remove the infected focus and sterilize the wound so thoroughly that no further infection has occurred. Fortunately, I shall be able to show you this morning a second patient upon whom we did this same operation a few months ago.

This young man is twenty four years of age. He has been married but a few months and denies any venereal history, and has a negative Wassermann. He has complained for six or eight weeks very bitterly of a very severe pain in his left thigh. He has been seen by a number of medical men. The case has been treated as one of neuritis, as one of sciatica, and as one of rheumatism. The possibilities of syphilis have been carefully considered, and in spite of a negative Wassermann he was put upon antispecific treatment, without, however, any benefit. When he came to me I had an x-ray picture taken of the leg, and it showed a small Brodie abscess about the same size as in the case that we have just operated on, on the posterior and outer part of the femur about 6 or 7 inches above the knee-joint. This patient has complained of very intense pain. This pain was so severe that it was only partially relieved by narcotics. We did the same operation for him that I have just shown you, and from the time the man woke up from the ether he has never had another twinge of pain. We found a very similar abscess, a little larger amount of pus however, and little less granulation tissue than in the case we operated on this morning. In this boy's case we made an immediate closure of the wound and obtained primary union. He has never had any further symptoms.

These cases emphasize the importance, of course, of accurate diagnosis, and I think also of the modern technic that we are now employing. In the old days before the use of the x-ray the diagnosis in these cases was very much more difficult than it is now, and yet Brodie and the surgeons after him made an accurate diagnosis from the clinical picture often and relieved the condition by trephining over the tender area. They insisted on an accurate location of the point of tenderness before operation and then either with a trephine or chisel cut through the bone at that point to the abscess, which experience had taught

them was responsible for this peculiar clinical picture. For a long time surgeons handled these cases by packing them with gauze and having the wound heal slowly from the bottom by granulation, and they were well satisfied with the result because they cured their patients, but it required a long tedious course of after treatment. After the introduction of the x ray, of course, the diagnosis was much more easily made and much more accurately made, and we can determine by a series of pictures the exact location of the abscess and can find it much more readily at the time of operation. Then, too, we learned that after a thorough mechanical removal of all of the infected tissue we could then make an immediate closure and, as a rule, obtain primary wound healing shortening very greatly the after management of the case. This, in fact, is exactly the same lesson that has been learned during the war, that if we mechanically remove the infected focus such as the material in shell wounds, all of the dead and devitalized tissue, foreign bodies, fragments of shell and clothing, that if we accurately remove all of the pieces of foreign bodies that are covered with germs or contain germs, we can then make a primary closure with excellent prospects of having the wound heal by first intention.

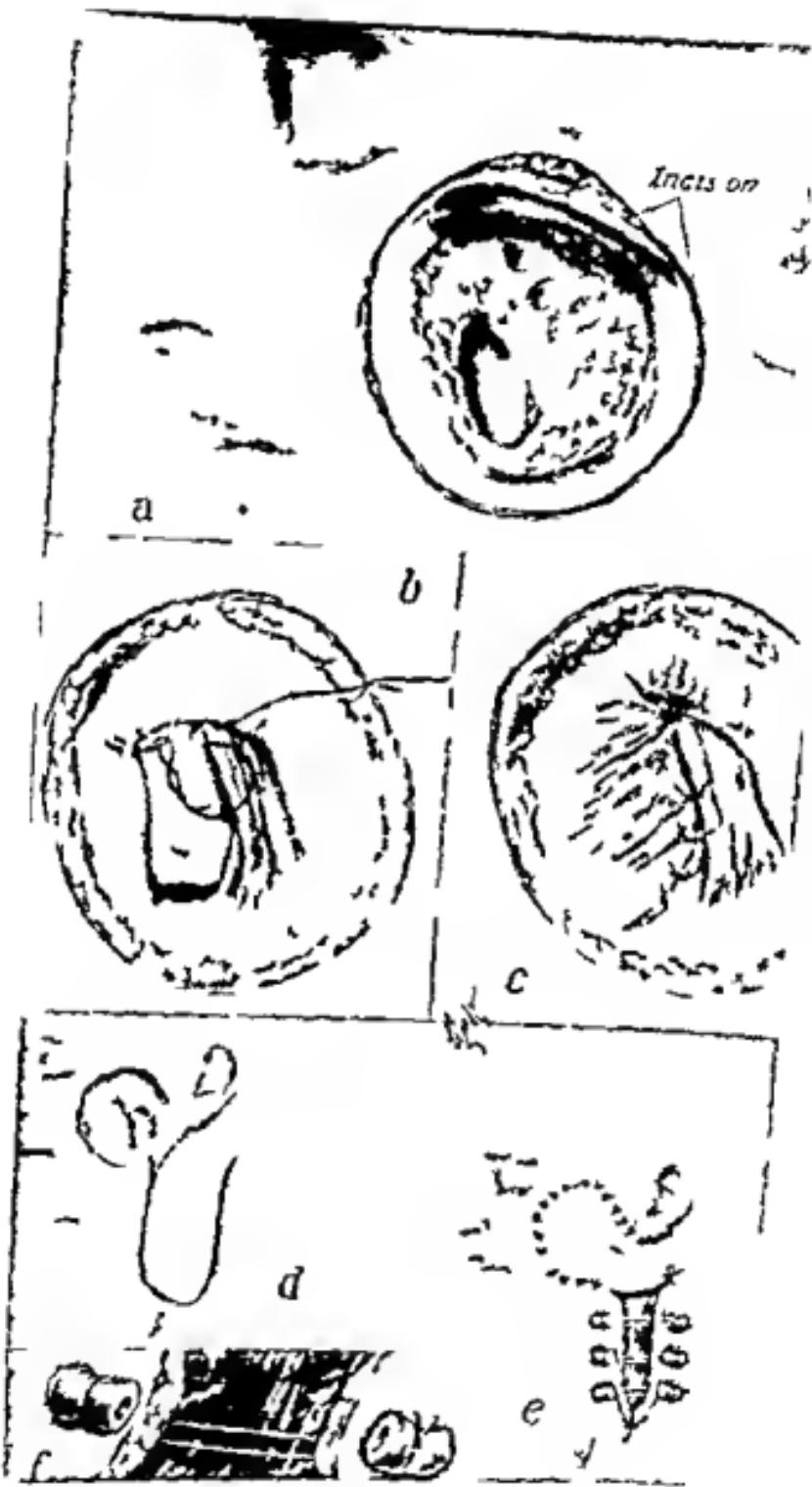
After-history—In the first case the stitches were removed at the end of the tenth day. There was a little ecchymosis about the wound and no suppuration whatever. The pain was gone when the patient woke up from the anesthetic and has not returned. I saw the patient again at the end of five weeks and he had made a complete recovery. The limb on that side, however, was somewhat smaller than normal due of course to the atrophy of disuse that had developed somewhat before the operation and had, of course, continued for several weeks afterward. This, however, is, of course, temporary. The man has made a complete recovery in the sense that he is rid of the suffering and tenderness.

RODENT ULCER OF FACE

Surgery I perforation of the cheek by ulcerating carcinoma complete removal of it and restoration of cheek by suture of mucous membrane and transplantation of skin from the neck.

THE first case that I shall operate on this morning is a man fifty five years of age who has had for five or six years a rodent ulcer of the left side of his face. This has been very slow growing and has been treated by a number of different methods. When it first began the physician in charge thought of the possibility of its being syphilitic and he was placed upon anti-specific treatment apparently with some temporary benefit. At that time the lesion was very small about the size of the end of one finger only and situated about the middle of the cheek on the left side. It was then treated with x-ray for a while and finally the lesion extended and involved the parotid duct producing a salivary fistula. The patient was brought to me for the purpose of curing the salivary fistula. This we succeeded in doing by a plastic operation (Clinic on Salivary Calculi Surgical Clinics of Chicago April 1918). At that time the dermatologist in charge of the case regarded it as one in which the epithelioma had been cured by x-ray treatment. A few months after our successful plastic on the salivary fistula the lesion reappeared as a definite ulcerating epithelioma. It was then treated with x-ray but without any benefit and he comes to us now with this large opening in the cheek through which food and saliva pour producing not only a great disfigurement but also a source of a great deal of annoyance to the patient. On examining all the facts in the case I have decided to remove the epithelioma widely with the knife and then fill in the defect by a plastic operation taking a pedicled flap from the neck.

The patient is now anesthetized and going widely of the lesion I dissect out an area irregularly 3 inches in diameter including all of the grossly involved tissue and going widely



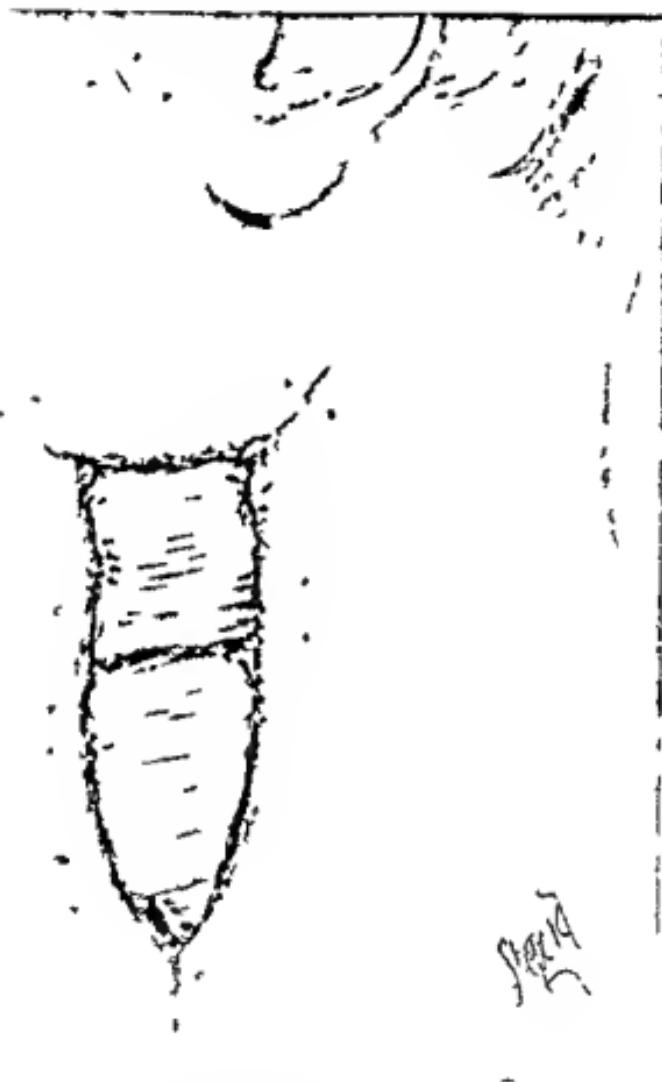


Fig. 254.—Thiersch grafts in neck wound

into normal tissue (Fig. 253 *a*). The defect in the mucous membrane of the cheek I shall attempt to make as small as possible by sliding the mucosa together (Fig. 253, *b* *c*) and holding

Fig. 253.—*a* Ulcerating carcinoma of cheek. Line of incision for its removal

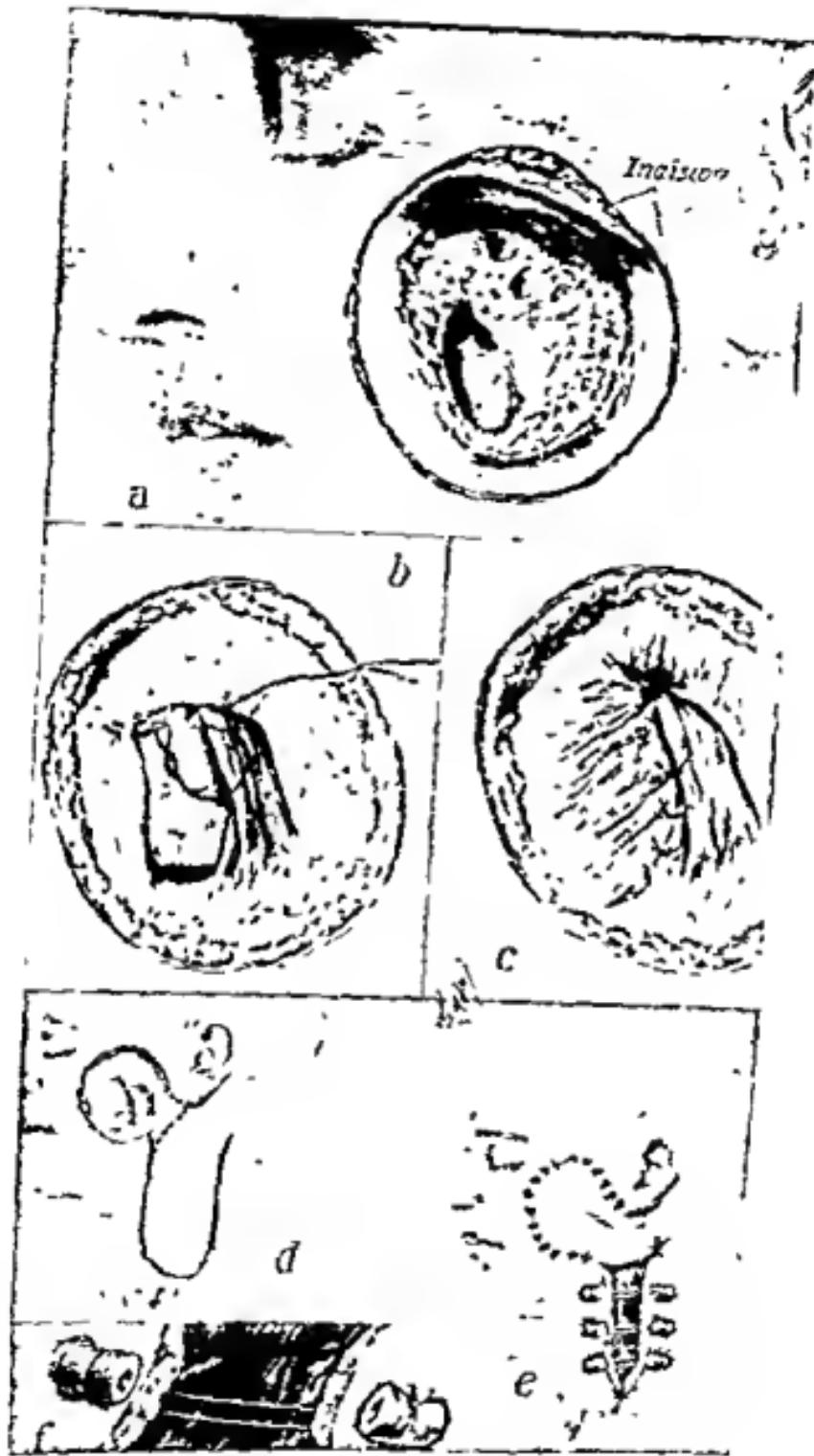


Fig. 233.

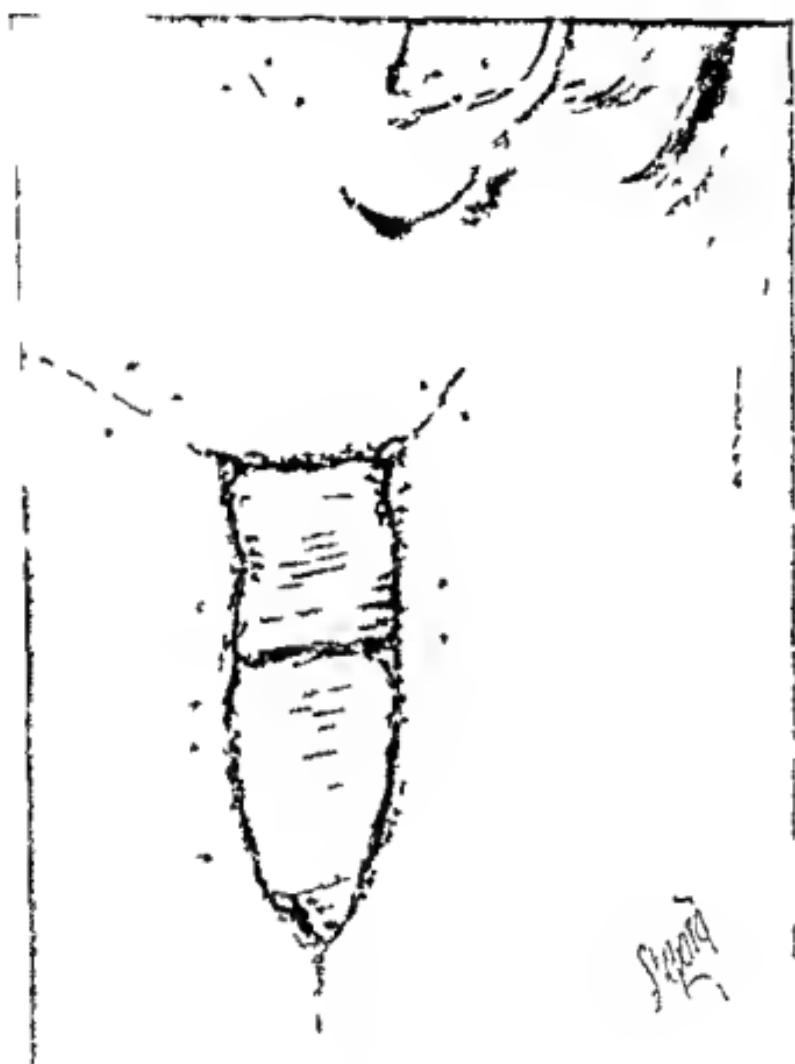


Fig. 254 Thiersch grafts in neck wound

into normal tissue (Fig. 253 *a*). The defect in the mucous membrane of the cheek I shall attempt to make as small as possible by sliding the mucosa together (Fig. 253 *b* *c*) and holding

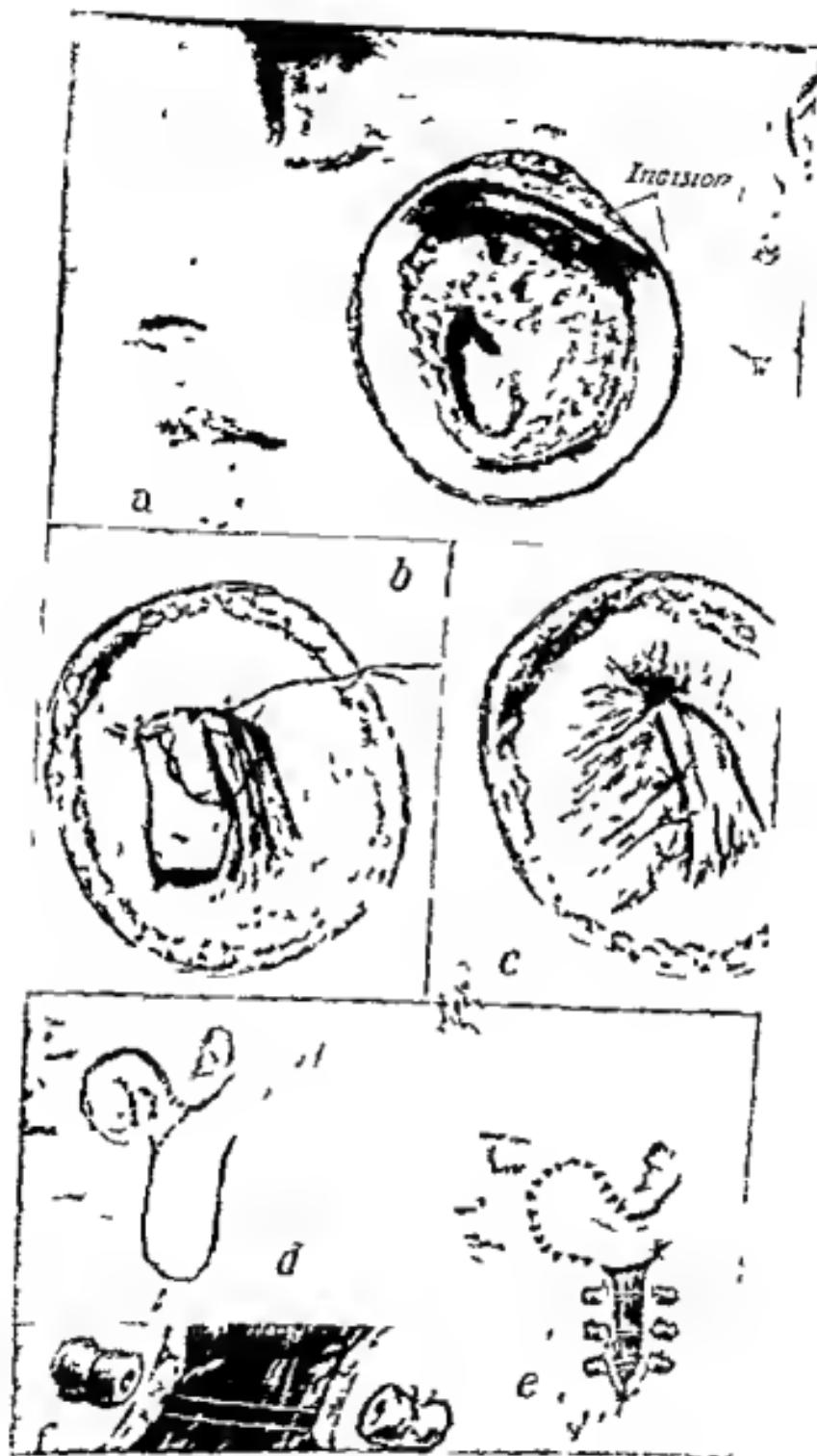


Fig. 243



Fig. 254.—Thiersch grafts in neck wound.

into normal tissue (Fig. 253 *a*). The defect in the mucous membrane of the cheek I shall attempt to make as small as possible by sliding the mucosa together (Fig. 253, *b*, *c*) and holding

Fig. 253.—*a* Ulcerating carcinoma of cheek. *b* and *c*

the edges in position by sutures. I now make a large flap of skin and superficial fascia of the platysma from the side of the neck (Fig. 253 *d*), make a turn of about 90 degrees and bring the flap into position so as to cover the defect and stitch it in place with fine black silk sutures. The defect on the side of the neck is as you see a very extensive one and I am not able to bring the edges of the skin together and make a complete closure, but I can make this opening very much smaller by drawing the edges of the incision together with three mattress sutures tied over a small piece of cigarette drain (Fig. 253 *e*, *f*). I shall later after the neck wound has granulated nicely remove the mattress sutures and cover the defect with skin grafts (Fig. 254).

After-history — The patient made an admirable operative recovery and at the end of ten days to two weeks under local anaesthesia we removed two good sized grafts from the back of the left arm and covered the defect on the neck after I had scraped off the granulation with a curet and sterilized it with peroxid of hydrogen and 70 per cent alc hol. Fortunately the two grafts took and complete wound healing occurred in about ten days.

The operative result is excellent correcting the marked defect and the result is extremely satisfactory to the patient.

This case carries with it a moral. If five years ago we had proceeded to do a radical removal and skin grafting or plastic the prospects of permanent cure would have been very much better and the operation required would have been a minor one compared with the extensive plastic that was later demanded.

PILONIDAL CYST

Summary Definition of term—diagnosis—treatment by complete excision

THE second case I shall operate on this morning is a pilonidal cyst. The term "pilonidal cyst" is one that I learned from my old teacher of surgery, Professor Gunn. I believe that he coined the term though I am not absolutely sure of that fact. The term means a nest of hair. The location of these pilonidal cysts varies somewhat and yet as a rule they are in the midline from 2 to 5 inches above the anus either over the coccyx or the sacrum. In this case there are two very small openings as you see about the middle of the sacral area (Fig. 255 *a*). Their origin is congenital. They consist of a bud of epithelium that has been turned under the external integument. This congenital condition is quite common and many individuals go through life without its ever being a source of annoyance. As a rule however sooner or later the cyst becomes infected and produces symptoms which demand interference. Very often the condition is incorrectly diagnosed and when the cyst is close to the anus it is thought to be an ischiorectal abscess with an anal fistula resulting. I have seen a number of these cases badly handled because of that mistaken diagnosis. I have seen other cases that have been diagnosed as cases of osteomyelitis of the sacrum. The condition is so easily recognized after one becomes familiar with it that there is little excuse for these errors in diagnosis.

I shall operate upon this patient under local anesthesia. I shall infiltrate pretty well the skin and superficial fascia around this lesion and make a fairly wide incision, including both of these fistulous openings and the superficial fascia down almost to the periosteum of the sacrum. Retracting the edges of the incision I dissect out the superficial fascia widely being sure that I do not leave any of the cyst wall which I am sure exists in this case (Fig. 255, *b*, *c*). I have now removed an elliptic mass of tissue

including the cyst and on splitting it open as I do now you can see that there is a definite cyst wall containing pus and some hair that looks very much like the hair used by plasterers in making mortar. This is growing from the skin bud located beneath the skin. The sac contains not only the hair but also some sebaceous secretion and some old digested pus.

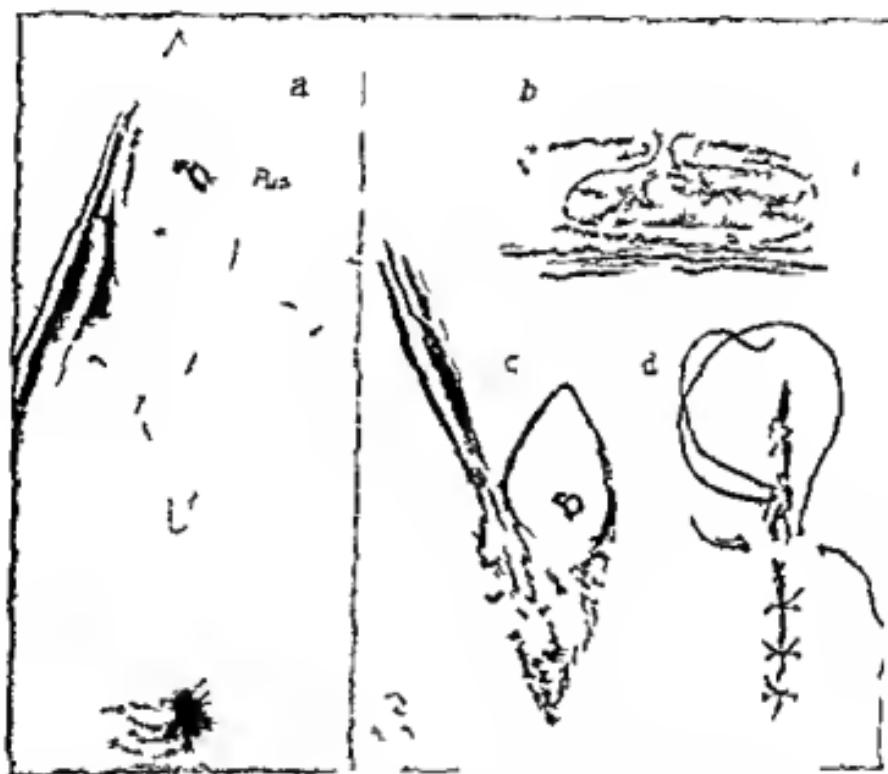


Fig. 255.—Pilonidal cyst. *a*: Cutaneous openings communicating with the cyst and incision for its removal. *b* and *c*: Removal of cyst with surrounding tissues *en masse*. *d*: Closure by interrupted sutures without drainage.

I will now close the incision with black silk sutures without any drainage (Fig. 255 *d*). I want to call your attention to one important point in dressing these cases that is, the use of stiff oxid of zinc paste covering the line of incision so as to protect it against any possible infection from the anus. I am confident that we have seen on our service 40 or 50 of these pilonidal cysts in the course of a number of years and have become quite

familiar with them. In the majority of these cases the correct diagnosis has not been made and many of them have been improperly handled. The usual method has been scraping the inflamed area and treating it as an abscess without excision of the epithelial sac. This of course simply gives temporary relief in the case of an inflamed cyst, but a fistula persists, and unless the pathology is understood the medical attendant is at a loss to know why the suppuration continues. There is but one way of handling them, and that is by complete excision, removing every vestige of the epithelial sac, and also, in long standing cases of suppuration all of the surrounding inflammatory tissue, and then obtaining a closure.

GASTROTOMY ON A BABY FOR THE REMOVAL OF AN OPEN SAFETY-PIN

THE third case I shall operate on this morning is a case that has been referred to us from the Pediatric Department of the Presbyterian Hospital. The history is briefly as follows:

This child who is about fifteen months of age was left by the mother for a few moments and on her return she found that the child's mouth was bleeding and the child was choking but after a few minutes seemed to be all right. The bleeding from the mouth was slight and temporary. The mother became alarmed however and on investigating found that a safety pin which she had left near the child was missing. She at once consulted a physician and an x-ray picture was taken showing that there was no safety pin in the esophagus but that the safety pin was in the stomach—the first picture showing it a little to the right of the midline directed toward the pyloric end of the stomach. The pediatrician feeling that it was possible that the pin might pass has kept the child under observation for some days. Yesterday a second picture was taken showing that the pin was in the same position. The pin is open and probably from the evidence which we now have the open safety pin has caught in the pyloric end of the stomach and there is little possibility of its passing normally and there is a probability that if allowed to remain it may be the source of grave danger to the child (Fig. 256 a). On that account I have advised a gastrotomy and removal of the pin.

The operation is a rather simple one. The technic however should be very carefully carried out so as to prevent any risk to the patient. The child is now anesthetized and I make an incision about $2\frac{1}{2}$ inches long in the midline above the umbilicus and divide the abdominal wall and the peritoneum. I now pick up the greater curvature of the stomach and pull it gently

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The operation is a rather simple one. The technic however should be very carefully carried out so as to prevent any risk to the patient. The child is now unanesthetized and I make an incision about $2\frac{1}{2}$ inches long in the midline above the umbilicus and divide the abdominal wall and the peritoneum. I now pick up the greater curvature of the stomach and pull it gently

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out through the incision I pull out the lower third of the stomach and finally as you see I bring the duodenum into view Carefully grasping the duodenum and pylorus I can distinctly feel the safety pin Holding it firmly with my thumb and fingers so as to bring the safety pin firmly against the interior wall of the stomach you see the visible ridge made by the pin (Fig 256 b) I make a small incision through the stomach wall and then seize the round end of the safety pin that is the end away from the pin point in an artery forceps and gently extract the pin from the stomach and then close the small incision with three rows of sutures one through the mucous membrane one through the peritoneum and muscularis and finally Lembert sutures invaginating the incision and obtaining a good broad approximation of the peritoneum so as to ensure against leakage (Fig 256 c d e)

After-history — I did not hesitate to feed this child six or eight hours after it came out from the anesthetic I felt confident that my closure of the abdominal wall would secure us against the dangers of leakage and the little patient went on to an uninterrupted recovery

It is hardly necessary for me to state that if the safety pin had been closed we would not have undertaken this operation A closed safety pin almost invariably passes through the alimentary canal without any difficulty and with no risk to the patient The same is true of most smooth bodies such as pennies marbles tin whistles etc that are swallowed by children Any smooth body that can pass through the esophagus into the stomach almost invariably will pass out without any difficulty It is remarkable that even such an object as an open safety pin will pass and not be caught and become fixed but where they are caught and become fixed it is of course a safer plan to make a gastrotomy and remove them as we have done in this case

Fig 256 — a Sketch showing abdominal incision and position of safety pin as seen by x-ray b shows removal of pin and closure of operative wound in stomach



FIG. 24

TUMOR OF THE URINARY BLADDER

Summary Diagnosis—partial removal by fulguration—later complete excision with electric cautery—defect closed by suture. General statement regarding the management of bladder tumors.

I HAVE a very interesting case to present to you this morning. A man about fifty was sent to us with a history of blood in the urine, and I think we can add bleeding from the bladder, because the blood came in greatest amounts from the bladder and there were no kidney symptoms of any kind. When he came to me he had just been cystoscoped and a bladder tumor found. He was admitted to the service of my colleague, Dr. Herbst, who cystoscoped him again, and found on the back part of the bladder on the right side about an inch above the ureter a tumor about as big as an English walnut. It was very vascular and was covered with a kind of papillomatous fringe which bled very easily. He at once proceeded to fulgurate the tumor. He did this on three different occasions and succeeded in stopping the hemorrhage entirely. I think that was the proper thing to do because the patient's hemoglobin was very low. The hemorrhage stopped, the man's general condition improved, he gained over 20 pounds in weight, and felt very greatly improved from the treatment. However after burning off by this process of fulguration the fringe-like portion of the tumor Dr. Herbst could see a solid mass back of this that was almost certainly a carcinoma. We talked the matter over together and came to the conclusion that we would resect the tumor by a radical operation.

This morning we shall put the man to sleep, fill the bladder with warm boric solution, and then make a pretty wide supra pubic opening keeping outside of the peritoneum. When I open the bladder I find this tumor just in the location that Dr. Herbst found it in the cystoscopic examination. I put the man in the Trendelenburg position and make an incision

the ureter. It is quite a different proposition from such a condition as carcinoma of the breast, where we can go very widely of the primary lesion and remove a very large block of tissue, or it is quite a different proposition from a carcinoma of the colon, where we can go very widely. If we are fortunate enough to make an early diagnosis and find there is not as yet any radical involvement. In these bladder tumors especially those situated near the ureter, we are limited in the amount of tissue we can remove. It is not desirable to injure the ureter on that side, because if you do you will have to proceed to do a nephrectomy and trust the patient to get along with one kidney, and good surgical judgment does not very often warrant the addition of that complication to the operation.

in the bladder about 3 inches in length, so as to bring the tumor very nicely into view. Then I take the electric cautery and going fairly wide of the tumor through the normal mucosa I cut out the tumor, cauterizing very thoroughly the mucosa and muscularis at the base of the tumor, the muscularis seems perfectly free when we remove it. After removing the tumor I have a big raw surface left, which I sew up with fine catgut, sewing up the mucous membrane and muscularis so as not to leave a dead space. Then I sew up the opening in the bladder. That controls the hemorrhage quite completely, so the bladder is perfectly dry. When the man was in the Trendelenburg position in order to prevent any urine leaking out of the wound I simply, two or three times during the operation packed a small sponge in the bottom of the bladder so as to soak up any urine that might be excreted into the bladder during that period. I close the 3-inch opening with catgut entirely except a place about as big as my little finger through which I insert a rubber tube projecting into the bladder for about an inch. I then close the suprapubic wound.

COMMENTS

I show this case to you this morning because I really feel that it has been well handled and that this method should be adopted in these bladder tumors that is, first an examination to outline the exact position of the tumor, second fulguration to control the hemorrhage, third a thorough excision by the method which I have just described to you. I think the patient will most certainly go on to a good operative recovery as far as the after management is concerned. Dr. Herbert and I have agreed that if there is the least evidence of recurrence we shall use either fulguration or radium, so I think we can obtain a good deal of relief for the patient if not a radical cure although radical cure in carcinoma of the bladder of that size is quite the exception. We are limited a good deal in the size of the block of tissue we can remove. For instance we cut to within $\frac{1}{2}$ inch of the right ureter as near as we dared to the ureter, but not as far from the tumor as we wished but, of course, it is not desirable to injure

AMEBIC ABSCESS OF THE LIVER

Summary Diagnosis—importance of the x-ray examination abdominal exploration under novocain demonstration of the abscess—technic of the surgical treatment—the importance of drainage and the folly of irrigation and antiseptics

THE first case I shall operate on this morning is a peculiarly interesting one. He is an Italian, about thirty years of age, who has been sick for about two months. He has been handled by some outside medical men, and I am inclined to think their early diagnosis was either pneumonia or pleurisy, and I think they were quite warranted in making that diagnosis. He had a history of an acute infection in the right upper quadrant of the abdomen and of the lower part of the chest on the right side, associated with pain, tenderness, chills, fever, and now—jaundice. We do not find any history of a preceding lesion like an appendicitis. I had Dr. Herrick see the case for me yesterday. He examined his chest and was at first inclined to think of the possibility of an empyema. We had, however, had the man examined with the fluoroscope and an x-ray picture made, which showed some interesting things. First, the lung on the right side is clear. Second there is a very high stand of the diaphragm on this side. The diaphragm is 2 or 3 inches higher than it should be normally on the right side. In the third place, he has a large, painful swelling in the upper abdomen right under the costal arch that is quite tender on pressure. Now we have to deal most surely with either an abscess of the liver or a subphrenic abscess, but the exact pathology I am not able to state. It seems to me quite clear that the proper thing here is, under local anesthesia, to cut down over this swelling just below the costal arch, and if it is a subphrenic abscess or an abscess of the liver to provide proper drainage.

The patient is now prepared for operation. I think good surgical judgment here would be to use a local anesthetic. The

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The patient is now prepared for operation. I think good surgical judgment here would be to use a local anesthetic. The

man has been sick for about two months. The character of the operation we are going to make does not require relaxation. We are simply going to cut down on the abscess and drain it. I think that can be done with a good deal of comfort to the patient under local anesthesia and with more safety than if we employed a general anesthetic.

You will notice that I make a wide wheal with this little fine hypodermic needle. Now I have anesthetized the area between my fingers, the skin and superficial fascia, and I have also, throughout the greater part, perforated the anterior sheath of the rectus, throwing some fluid into the sheath of the rectus. I am now dividing the skin and superficial fascia, and I have divided the anterior sheath of the rectus. I will now infiltrate the rectus pretty thoroughly. Let me call your attention to an interesting thing in these local operations in the abdomen. It is a very interesting and important fact that the parietal peritoneum is very sensitive and the visceral peritoneum has no sensation at all. You can resect a loop of bowel or cut it or tear it without any sensation whatever. The parietal peritoneum, on the other hand, has to be quite definitely anesthetized because it is quite sensitive. This patient's hemoglobin is down to 23 per cent. Now I am dividing the posterior sheath of the peritoneum. You see the pus welling out the minute we cut into the peritoneum. This is pus, with some hemorrhage in it. There is a very large abscess cavity, exploration of it with the hand is just like putting your finger out of an open window, there is no bottom to it at all.

Now I want you to follow this technic. I am not going to wash this abscess out. I am not going to try to force out any pus. I am going to let that pus come out just as it will in the dressings. Any one who would tell me to wash this out or use Carrel Dakin or any antiseptic would not know the first principles of surgery. It would be a very bad thing to attempt to sterilize this abscess by any mechanical method. It would not do any good. The thing is, to provide drainage with as little trauma as possible. This man will sterilize his own cavity and get well of this abscess by the power of his own juices and not by any chemical that you may introduce into it. I am simply

putting a couple of stitches here. Now that is all there is to be done. We have given the pus a chance to get out, now we will just feed him up and he will get rid of the toxemia produced by the pus under pressure and that enormous cavity will gradually contract. I do not know what the pathology is except that we have a great big abscess. I do not know what the primary focus is, but I do know that the proper thing to do here is simply to provide an exit for that pus. If I were perfectly sure that the wound would stay open without a tube I would leave the

and then his own power of resistance against this infection, which will consist of antibodies and juices of his own body, will eliminate the infection, just exactly as it does if a man recovers from measles or when he recovers from influenza or from typhoid fever. It is not anything that you do in a case of that kind at all. Suppose a man has a gangrenous empyema, what can you do? The thing to do is to provide drainage with as little trauma as possible. You cannot be of any service whatever by drugs or by antiseptics. That has been shown very definitely and absolutely in this epidemic in spite of the fact that men of limited experience have been enthusiastic about the value of antiseptics in the pleural cavity. In gangrenous empyema with as little trauma as possible you get an exit for the pus. Here, again, if you can get along without a drainage tube you should do so but if you must use one be sure that it is a short tube. You want to provide good drainage, but you never want to irrigate the cavity, you never want to try to wash out all the pus. When you relieve the man of the toxemia from the absorption of pus under pressure he will begin to get better.

As to the possibility in this case—this may be an amebic abscess of the liver. That will be determined by an examination of the pus. It might be a subphrenic after an appendicitis, which has been overlooked. It may be a subphrenic after a duodenal ulcer that has perforated—a subacute or chronic perforation of a duodenal ulcer. I say that because we have

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exactly that same condition from these different pictures, from a duodenal ulcer, from an empyema, from an abscess of the liver, or from a subphrenic abscess. Of course, good surgery would not permit us to attempt, at this sitting, to make an extensive examination of this man's abdomen to find out what the cause is. That would not be warranted at all. It would not be good surgery to mop out this pus, or if it was a duodenal perforation to try to handle it in the face of this great abscess. That would be poor surgery and would be absolutely unwarranted. Further examination of the case will show whether it is an amebic abscess or a duodenal ulcer which may later require a gastro-enterostomy, or an appendicitis which will later require removal of the appendix.

Note—Microscopic examination of the fresh pus on a warm stage revealed the presence of numerous actively motile amebas.

